

FINAL REPORT - NOVEMBER 1985

1: INTRODUCTION

On 7 June 1982 the 'Micros for GPs' scheme was announced to promote awareness of information technology in General Medical Practice. The Department of Industry, now Department of Trade and Industry (DTI), offered to meet half the cost of purchasing and installing a micro-computer system of appropriate size in up to 150 British general practices. The DTI offer also covered the cost of training and maintenance for the first three years, and a grant of up to 20 pence per record was made available towards the cost of record conversion during the first year. The systems were supplied by British Medical Data Systems Limited (BMDS) and CAP (UK) Limited and included facilities for patient registration, the issue of repeat prescriptions and the recall or screening of patients.

An integral part of the scheme was the concern to evaluate the effects of introducing a computer into a doctor's practice. A Project Evaluation Group was therefore formed by representatives from the DTI, the Department of Health and Social Security (DHSS) and General Practice, and a team from the MRC/ESRC Social and Applied Psychology Unit in Sheffield was commissioned to advise and assist. The objectives of the evaluation were specified and details of the methods decided. Information was requested from all the practices involved to provide a broad view of the impact of the computers over the first year of use, and a smaller number of practices were to be examined in greater detail. The systems and practices were not to be directly assessed although it was hoped to identify factors which promoted or impeded effective use of the computer systems.

In October 1984 an Interim Report about the scheme was published describing progress and discussing the initial tasks associated with using the computers. Copies of this report are available from the DHSS Leaflets Unit. This Final Report outlines further progress and considers more fully the effects of the computers over their first year of operation, based on information available to the Evaluation Team up to April 1985. The aim is to cover concisely in the text the major points of interest to potential and actual users and suppliers of GP computing systems. More detailed background information may be found in the Appendices. The report is intended to be read independently of the Interim Report, but duplication of previously published material has been avoided where possible.

2: OVERVIEW OF THE SCHEME

In the summer of 1982 information about the 'Micros for GPs' scheme was circulated to about 20,000 British general practitioners and applications were invited. About 1000 completed applications were received by October 1982 when selection took place. To facilitate the administration and

evaluation of the scheme, 9 geographical 'clusters' of practices were chosen in areas where most interest was shown. Selection of the practices to be offered a computer was made to provide a broad cross-section of General Practice, in terms of location, size and whether or not the practice offered GP trainee placements. A local GP was invited to act as scheme 'co-ordinator' in each cluster. Thirty-five practices decided not to take up the offer usually for financial reasons or because they felt the systems available did not meet their needs. These were replaced by others from a reserve list of practices expressing interest. Only two practices decided to withdraw after delivery of the system.

The first computer systems were delivered in January 1983 and by June 1984 140 systems had been installed. In addition, 9 systems were supplied to the co-ordinators, although these were not formally included in the evaluation study. Within the first year of use, four out of five of practices had adopted computerised registration and repeat prescribing procedures, although the speed of data entry may have been affected by the 12 month limit within which it had to be completed to attract scheme subsidy. Other clinical information had also been entered, and practices had started to use the computer for screening and recall, although considerable further work was needed to realise more fully the analytic potential of the computer systems. Over the second year of use further progress was made, and some practices began to use the computer as an aid for clinical and administrative audit.

During the scheme, meetings of the co-ordinators and of the practices within each cluster provided a network for the discussion of General Practice computing. As the practices gained experience of the systems, their sophistication as computer users increased. Suggestions for the improvement of the systems were communicated to the suppliers, and the practices had the opportunity of learning from each other's experiences. In this way, the scheme was making both suppliers and practitioners more aware of the requirements and potential of General Practice computing.

3: IMPLEMENTING THE SYSTEMS

Practices made preparations for the arrival of the computer in various ways. Nearly all reported incurring some expense in making physical alterations. The average expense was about £430 per practice; the maximum was over £5,000. On the whole, however, these costs were small relative to the price of the system itself. About a third bought additional hardware or software before delivery, spending an average of about £1,000 each. Some practices took on new staff; many checked pre-existing data. Although prior discussions about the computer took place in the vast majority of practices, few ancillary staff were usually involved. Perhaps in consequence, most felt unprepared for the arrival of the computer. Since the staff have been the main computer users, their increased involvement in the preparations would have been desirable.

The training offered by the suppliers mainly concentrated on keyboard skills and use of the basic computer facilities. Its standard appears to have been generally acceptable, although most practices agreed that training should not be given in a single block, but in stages phased appropriately over time

to match their rate of progress. Practice comments, particularly from the staff, suggested that some disruption of the training arose through inadequate staff cover and concurrent needs to attend to other practice tasks. The documentation made available by the suppliers was generally regarded as less than satisfactory, being neither comprehensive, nor easily understood. There was also little on screen documentation and the 'Help' facilities were regarded as inadequate by many. Such failings are unfortunately all too common in micro-computer applications. However, good documentation and 'Help' facilities can reduce the need for basic training and subsequent supplier support, particularly when there are staff changes.

Much learning took place on a 'trial and error' basis. Time to practise and help from work colleagues were of particular importance. Good internal relationships were therefore valuable, particularly those between 'key' computer users and other staff and doctors. Computer operators in the co-ordinators' practices on occasion played significant supporting roles to practices in their clusters, and discussion at cluster meetings also helped important wider issues to be addressed. However, more systematic training in the management and use of information would have helped the practices to exploit more effectively the analytic potential of the computer.

In general, data conversion was a considerable, and perhaps underestimated task, although it was made easier where well organized information systems existed before the computer was installed (eg summary cards, manual registers, repeat prescription cards, etc). Practices generally started by converting registration data and then proceeded to repeat prescriptions, usually within the first year of use. About 6% however included medication or other clinical details in the first batch of data extraction. Practice estimates of the time needed for this first stage varied considerably, but averaged 4.6 minutes per record for practices who did the work themselves. This figure largely excludes the entry of clinical data required for patient summaries and recall programmes, whose volume can make its conversion particularly time consuming, and for which information categories have to be agreed.

Computer systems are not self-sustaining particularly while manual information systems continue in parallel. The computer requires regular updating, and this demands well organised clerical procedures around the computer system. Many of these demands fall on the doctor, particularly in relation to medication and other clinical information. Procedures need to be specified at a greater level of detail than is normally necessary to sustain practice administration, and once a consensus has been achieved a commitment to that consensus is also necessary if the systems are to be durable and not die by default.

Since the effective implementation of a computer system requires both time and effort, doctors and staff must expect to work harder during this period, and in some cases additional staffing may be needed. Although there were wide individual variations, practices in the scheme showed average increases of 9% in the numbers of hours worked by their clerical and administrative staff at the end of the first year. Meetings and discussions in the practices also tended to occur more often and staff continued to want more meetings. Further developments will again depend on appropriate planning and resourcing.

The reliability of the systems varied considerably from one practice to another, some having very few or no problems and others experiencing considerable difficulties with the computer out of action for as much as one or even two days per week. In general, problems occurred less frequently as the systems became established, although their prevalence rose again when software updates were issued. During 1983 practices reported 12 days lost on average per year of use due to computer breakdowns; in 1984 the figure was 9 days per year of use. Reports from the suppliers suggested that the practices were contacting them rather more than twice a month on average. The reasons for difficulties were often unclear to the practices, but according to the suppliers about a quarter concerned hardware, the remainder being split equally between software problems and general queries. The Walters printers supplied by BMDS caused particular problems and were replaced by another Walters model early in 1985. Regular use of back-up procedures restricted the amount of data lost due to breakdowns, although about a quarter of the practices did not take copies of the daily transaction file every day and about a third reported problems in taking back-ups. Although about half the practices never had manually to re-enter data lost, some of the others experienced substantial difficulties.

The standard of support provided by the computer suppliers was regarded as reasonably effective within the terms of the contract, although when problems could not be solved over the telephone practices quite often had to wait more than 24 hours for engineers to call. Some difficulties seemed to be due to lack of local supplier representation or through failures of communication between the suppliers and their hardware sub-contractors. The provision of remote support is in any case always difficult, and tends to tie up busy phone lines for long periods. The extent of preventive maintenance also varied. BMDS did not think it appropriate, and two thirds of the practices reported that no preventive maintenance had been carried out.

The screens and keyboard appeared to be well liked by users and the computer procedures were regarded as fairly straightforward in general. Response times were thought less satisfactory, and particularly so for the BMDS level III system. This implementation of a modified ('detuned') version of the Exeter software also did not allow multi-user extensions (which many of the larger practices desired), and was not updated by the suppliers. However, the users liked the software in many other respects and transferred to Exeter systems running on DEC hardware in Autumn 1985. Some practices that chose small floppy disc based systems also found their use unsatisfactory as a result of fragmentation of the patient data base across a number of discs.

Difficulties were widely experienced in diagnosing and recovering from errors possibly as a result of the rather poor standard of error messages and documentation, both written and on screen. As practices gained experience they became more aware of other shortcomings and potential improvements. Some, particularly the larger practices, found it necessary to buy extra VDU's or printers. Similarly, some bought additional software modules. A number of criticisms of the usability and suitability of the software were made, for example, of the CAP recall facilities and house-keeping routines. Many of these however were addressed through the issue of updates to the systems. CAP made use of the co-ordinators' expertise both to focus suggestions for improvements and for the field testing of new software. BMDS, on the other hand, adopted a more individual approach.

Sensitivity to users' needs is of obvious importance in the further development of General Practice software.

5: PATIENT REGISTRATION

Practices varied in the detail entered and the amount of checking done during registration data conversion. One in six commissioned a data preparation company or had the information transferred directly from FPC or Health Board computerised registers; the remainder did it themselves taking between one and 15 months to complete the task - an average of between 5 and 6 months. Few however printed a list of patients registered and systematically cross-checked the data.

The conversion of registration records in the practice takes time. However, since practice staff are usually involved working from the individual patient's record rather than an age/sex register, a more accurate product probably results than if a data preparation company is used whose staff are unfamiliar with the practice population and whose procedures are outside practice control. Where sufficient staff time in the practices is unavailable and an accurate manual register exists, commissioning a reliable data preparation company may sometimes be preferred. Direct transfer from the FPC will also be effective in some cases, although discrepancies with practice held records must be considered.

Practices registered new patients on the computer, and the registration screen was also commonly used to check registration details. In this sense the computer system tended to displace previous manual systems, even when these systems were maintained in parallel as they were in about half the practices. A few practices began to use computer registration details to check capitation payments or progress in receipt of notes for newly registered patients. Although comparatively little use was made of the computer registration facilities for tasks beyond those achievable with a good manual system, two thirds of both doctors and staff thought the computer system was preferable to manual registration methods.

6: REPEAT PRESCRIBING

Doctors in the scheme identified three objectives in computerising repeat prescribing: a reduction in the preparation time (efficiency), tighter control of patients' requests (safety) and an enhanced overall view of the pattern of prescribing (audit). The further needs of some dispensing practices for medication labels and stock-control were not provided for within the scheme.

There are no absolute standards of adequacy for the production of repeat prescriptions, and both manual and computer procedures vary between practices (and individuals within a practice). To some extent there is a trade-off between efficiency and safety, as checks seen as necessary by one practice may be seen by another as inefficient. Measures of the time taken by ancillary staff to produce repeat prescriptions reflected these differences. In some practices a little time was saved by using the computer; in others it took longer. Time reductions were generally offset by the necessary housekeeping and updating activities associated with the

computer system. Substantial time savings seem unlikely while manual repeat prescription records are maintained. About 80% of doctors and 70% staff, however, thought that the computer had made the job of producing repeat prescriptions easier.

Some practices adopted more systematic procedures and rules when using the computer. For example, 9% more had a rule about repeat prescriptions that was clearly known by the patients and 8% fewer allowed requests to be made by telephone. Turnround time (between the patient making the request and it being ready for collection) was also increased in at least 12% of cases. However, although patients reported waiting rather longer than before for their request to be ready for collection, they regarded the printed prescriptions as more legible, and were generally well satisfied with the prescription service both before and after computerisation. Patients were also more aware of receiving written advice with the prescription as a result of the use of the right-hand side slips.

More systematic procedures should lead to safer prescribing, although no concrete evidence was available as no external clinical assessment was possible. The facilities offered by the computer systems to constrain issue were often not fully used, and accurate updating of the computer files could not be ensured. However, two thirds of doctors and 40% of staff believed the computer to be safer, although perhaps in consequence over a quarter of the doctors said they checked the prepared prescriptions less than previously. In some practices the computer encouraged the review of repeat medication, especially during the data conversion process. In this way, safety may have been enhanced.

Audit could increase not only the safety but also the cost-effectiveness of prescribing. A number of practices initiated full or partial generic substitution. Repeat medication data can also be used to analyse morbidity. As the practices gain experience with the computer systems, such developments should become more common. Although acute prescribing is not usually recorded, and the computer report routines would benefit from further development, there can be little doubt that computers will facilitate audit.

7: RECALL AND SCREENING

Up to two thirds of doctors were dissatisfied with their manual procedures for screening and recall, and nearly all of them (93%) thought that more effort should be devoted to this area. A similar proportion expected the computer to improve the delivery of anticipatory care. This however requires the specification of the necessary clinical information, and the conversion of data from the manual records. The size of the consequent workload varies according to the choices made. Screening and recall in themselves also generate more work, and procedures need to be set up for handling the increased patient contacts.

Not unnaturally therefore most practices concentrated initially on registration and repeat prescribing procedures. When the entry of other clinical information was considered, many practices found it hard to specify the purpose to which the data would be put and an appropriate method of categorisation. Those who were interested in coding morbidity were also hampered by the lack of a single, generally agreed and accepted General

Practice morbidity coding scheme. In addition, some practices were waiting for the new RCGP coding scheme to be published. Further difficulties arose through the design of the CAP recall facilities, which were reported to be extremely difficult to use, but were not modified until late in 1984. The information recorded was thus inevitably incomplete, although most progress had been made where prior manual registers or summaries existed or when data was entered as part of the routine processing of item of service claims or test results.

Three quarters of the practices made some use of the computers for recall or screening, although often for programmes based on age and sex criteria alone (such as rubella vaccination, reported by half the practices). In addition to rubella, other common areas of use were cervical cytology and, through the medication files, the identification of patients on particular drugs. Most practices however continued to maintain previous manual methods of recall.

By facilitating the retrieval and analysis of information, the computer should promote effective preventive care, but few practices provided sufficient data about their recall activities to enable comparisons to be made. The available figures did not show a significant change in vaccination rates for diphtheria-tetanus boosters or rubella over the first year of use of the computers. The development of these activities over a longer time period as the practices gain experience and the software is improved will be of particular interest.

8: INNOVATIONS

The introduction of the computer required changes in the way common practice tasks were carried out. As a result opportunities arose to review activities and effect additional change. During the entry of repeat medication data, for example, some practices were able to identify patients whose medication required review. Others took the opportunity to introduce partial or full generic substitution, or to alter the amount of notice required of patients when requesting repeat prescriptions.

The reporting functions of the computer also facilitated the more systematic monitoring and assessment of information. Inconsistencies and omissions in data recorded became more evident. Similarly reports from the registration files were used by some practices to clarify discrepancies with FPC lists, or for the listing of patients in particular age bands, often for the use of health visitors. Other practices used the medication files to identify patients on particular drugs or to promote discussion about prescribing habits.

Practices also took advantage of the computer facility for printing summaries of the information recorded for individual patients. These were put in the notes and used to record changes and additions made in the consulting room, and in some cases as a prompt for missing information. Some practices sent these summaries with referral letters; others included them in the notes when patients moved to another practice. Those word processing facilities provided by the systems were also exploited to some extent, often in conjunction with new or enhanced recall programmes.

It is difficult to determine to what degree the computer itself is responsible for these changes. Most do not depend on the use of a computer, nor are they necessary consequences. However, it seems that the computer is a catalyst for change. The disruption of established routines offers the opportunity, the possibility of more effective data retrieval creates the incentive, and the systematic approach required for effective computer use acts as a guiding hand.

9: ATTITUDES

On the whole doctors were more favourable than staff towards the use of computers, and also perceived more deficiencies in previous manual systems. However, although about two thirds of doctors thought that more effort and attention could profitably be spent on procedures for registration and repeat prescribing, it was only in terms of recall and screening that a majority were dissatisfied with their manual methods.

Doctors expected benefits in a number of areas (eg more efficient recall, improved monitoring of prescribing, better records and planning). However they did not expect financial benefits and less than half of them thought time savings would result. There were also more global reasons for wishing to join the scheme: to promote changes in practice procedures, to be 'progressive', or because the scheme offered the support of a government sponsored initiative or was felt to be good value for money. Doctors also expected problems to arise, particularly in the transitional period. Moreover, there was some anxiety and apprehension expressed about the prospect of working with a computer, particularly by the staff.

Although the doctors' expectations of benefits were largely maintained after three months' use, two thirds of them reported problems to have arisen in staff reactions to the computer. A third of the staff thought that relationships amongst themselves and between them and the doctors had worsened. This early period was seen as a time in which the efforts of data conversion were not matched by any tangible return.

After a year of use, most doctors reported that benefits had arisen in the areas they had expected, and particularly in relation to registration and repeat prescribing, where four out of five thought gains had been made. More than two thirds of staff also thought the computer had been useful. However, difficulties had been experienced by two thirds of doctors and staff, not only with the computer hardware and software, but also in terms of the change in working methods needed. A continued deterioration in the relationships between doctors and staff and amongst the staff was reported by about a third of respondents. One doctor in six also noted similar difficulties amongst the doctors. Such problems clearly call for sensitive management if progress is not to be jeopardised.

People who started with positive views about the use of computers tended to retain them. Many of the undecided developed more definite views, both positive and negative. Most doctors and staff were confident of the usefulness of computers in General Practice. Moreover, about 70% of both staff and doctors felt that the computer had been worth getting, and over 90% wished to maintain or expand its use.

10: FACTORS AFFECTING SUCCESS

Although successful computer use is difficult to define, and change takes time, the one year period of assessment allows some conclusions to be drawn. The weight of evidence so far suggests that substantial gains in practice efficiency or effectiveness cannot usually be expected from the use of computers for the day-to-day routine of General Practice administration. Good manual systems can adequately support patient registration, the issue of repeat prescriptions and simple recall programmes. However, the computer seems to offer significant advantages in the aggregation and analysis of data which has already been entered to carry out the simpler tasks. It might therefore be expected to facilitate practice planning, administrative and clinical audit, more comprehensive recall programmes and research.

Such changes depend on practice members becoming more conscious of the information and organisational needs of their practice, and of the requirements for the establishment and maintenance of effective information systems. They demand a willingness by both doctors and staff to accept that their own actions should be subject to review and possibly change. These requirements, however, may also be seen in themselves as benefits of computerisation.

It seems therefore that successful practices in these terms will tend to be those with well established manual systems and a history of a systematic group approach. They will combine realistic expectations with adequate resourcing for the tasks involved. Both staff and doctors will be interested and involved. Although in general size is not important, single-handed practices, where the doctor dedicates considerable time to the task, may often make particularly rapid progress.

Inhibiting factors include limitations of the computer systems, particularly in relation to reliability and data analysis (eg report generation), and the lack of suitable experience, training and support in how reviewing activities can contribute to practice effectiveness. Although committed staff can take the practice some way on the path of computerisation, further progress demands an equal or greater commitment from the doctors. However, the financial arrangements for general practitioners do not promote the use of computers as there is little incentive for anticipatory care or more cost-effective medication.

11: FINANCIAL CONSIDERATIONS

Only 20% of doctors expected increased income or decreased running costs as a result of using the computer, and some two thirds anticipated that problems would arise in financing the computer. Their reports after one year of use largely bore out these expectations. Very few doctors reported financial benefits and about a half noted that some financial problems had been experienced, despite the grants available through the scheme.

Difficulties arose in the interpretation of the data available for analysis about practice receipts and expenditures. They were incomplete, and no comparative figures for practices not using a computer were available.

Furthermore they showed considerable individual variation. However, costs for data conversion in the first year averaged 22.3 pence per record, slightly more than the 20 pence per record subsidy available. In addition, staffing costs increased by an average of 13% (wage inflation was about 8% during this period), although this was substantially offset by proportional increases in reimbursements from the FPC or Health Board. Capitation payments did not significantly change, but average payments for temporary residents, cervical cytology and immunisations increased. This may reflect inflation, additional practice activity in these areas or more effective claim procedures.

Although practice receipts represent additional costs to the FPS, the remuneration system by which GPs' fees and expenses are calculated will tend to reduce their impact in the longer term. One area of considerable long term consequence to the FPS budget, however, is the cost of prescribing. The figures examined (for the last full month available before computerisation and the first full month after) showed no significant change. However, many practices would not have had sufficient time during the period considered to make full use of the computer facilities for repeat prescribing.

One year is a relatively short time in which to consider the cost implications of General Practice computing. Additional changes may be expected in practice activity as more use is made of the computer systems. Enhanced information provision may also help in a wider context to direct the delivery of health care. Further examination of this area over a longer period of use will be necessary if these issues are to be addressed more fully.

12: CONCLUSIONS

The original objective of the Micros for GPs scheme was to promote awareness of information technology in General Medical Practice. Through the scheme, about 600 doctors and 1,000 ancillary staff have gained direct experience of computer systems in some 150 general practices. These constitute between a third and a half of all of those using commercially available General Practice computing systems. In addition, through the cluster and coordinators' meetings, avenues of communication have developed between the practices themselves and between them and the suppliers. Practices have increased in computer sophistication and become able to formulate their computing needs more effectively. In these ways, the scheme has certainly succeeded.

There is also a growing awareness that as a rule the main benefits of computerisation do not lie in the mimicry of manual procedures to carry out the routine tasks relating to individual patients - registration, repeat prescriptions, simple recall. Indeed it seems doubtful that the costs of computing can be justified on this account alone. Rather it is in the aggregation and analysis of information that the computer's analytic strengths seem to offer real advantages. However, an adequate assessment of the computer's value here requires a longer period than the 12 months use so far examined.

Computers demand a systematic approach to data gathering and offer more efficient ways of retrieving and analysing information. By using data entered for routine administrative tasks, practices have started to assess what they are doing, to plan and review their activities and to introduce change. Such developments would be encouraged by further improvements to the computer systems, in particular to the data analysis facilities. They depend also on general practitioners adopting a more pro-active role and understanding their roles as both providers and users of data. Appropriate managerial and organisational skills are also needed to respond to the human problems that inevitably arise. In this way, full advantage can be taken of the opportunities that the computer presents as a catalyst for change.

Outside agencies may also have an interest in the analysis of information from General Practice. Health Authorities who want to improve their own planning and resource allocation may seek the appropriate data from general practitioners, as may drug companies and others. Developments in Family Practitioner Committee computing offer further important opportunities. Consideration of the relationships between FPC and General Practice computing is now required, so that the co-ordinated use of computers may promote the effective co-ordination and targeting of health care.



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INTRODUCTION

1.1: The Systems

The suppliers offered three sizes of system in the scheme. The CAP software was identical throughout, but the BMDS Level III (large) system was based on a modified version of the software developed by the FPC Computing Unit at Exeter, while their Level I and II systems (small and medium) offered software developed by BMDS.

1.2: The Evaluation Objectives

The objective of the evaluation was to answer the following questions:

- A What cost and difficulties are met when computers are introduced into General Practice?
- B How reliable are computer systems in practice?
- C Do the initial attitudes of staff and partners affect the success of computerisation? Are attitudes changed by training and use?
- D Do practice characteristics affect the success of computerisation?
- E Does the use of computers in practices result in a safer or more efficient procedure for repeat prescriptions?
- F Does the use of computers result in increased efficiency of recall for preventative procedures?
- G Does the introduction of computers lead to innovations in Practices?
- H Is the time taken to complete common office tasks affected by the use of a computer?
- I Does the use of a computer system lead to an increase in the overall cost of Family Practitioner Services?

1.3: The Evaluation Methodology

Two interlinked approaches were adopted. In one, the 'light' evaluation (LE), a broad assessment was made of the experience of each participating practice. In the other, the 'detailed' evaluation (DE), a more detailed study was conducted in a subsample of the practices.

The light evaluation:

Brief details of the questionnaires and logs developed for the light evaluation by the PEG are presented in Table 1 below. (Copies of the materials were included in the Interim Report.) They were incorporated into evaluation packs, which were distributed by the DHSS to local co-ordinators (see Appendix 2.2), and thence in turn to participating practices. Completed forms were received by the co-ordinators and forwarded to the DHSS for subsequent transmission to Sheffield, where the responses were analysed. This information was supplemented by telephone interviews with every practice to assess progress conducted by the co-ordinators and their secretaries in January 1984 and November/December 1984.

Table 1: Details of light evaluation questionnaires and logs

Type	Code	Times of completion
Practice profile	PP	Before and 1 year after delivery
Practice finances	FPS1	Before and 1 year after delivery
Repeat prescriptions (1)	RP1	Before and 1 year after delivery
Repeat prescriptions (2)	RP2	Before and 1 year after delivery
Repeat prescriptions (3)	RP3	Before and 1 year after delivery
Recall/screening	RC1	Before and 1 year after delivery
Discussions with suppliers	INST1	Before delivery
Cost of alterations	INST2	After delivery
Installation details	INST3	After installation
Training details	INST4	After training
Data conversion	INST5	After data converted
New procedures	NP1	Recurrently after delivery
Operating problems	OP1	Recurrently after delivery
Security procedures	OP2	1 year after delivery
Computer use	C	1 year after delivery
Doctors and staff were also asked for their views as follows:		
Attitudes to computers (1)	ATT1	Before delivery
Attitudes to computers (2)	ATT2	Before delivery, after training and 1 year after delivery
Attitudes to computers (3)	ATT3	1 year after delivery

The detailed evaluation:

The DE study sought to complement the LE work by examining 24 volunteer practices more closely than was practicable among the whole sample. Its purpose was not only to further document what happens when computers are introduced to General Practice but also to provide explanations for any changes that occurred.

All the practices were visited by the Evaluation Team on at least 3 occasions: before the computer was delivered, about 3 months after delivery and about 12 months after delivery. Practice staff and doctors were interviewed each time, and asked to complete detailed questionnaires focusing in turn on pre-computer procedures and attitudes; initial reactions after delivery; and more established post-computer procedures and attitudes. Additionally a 'practice representative' questionnaire sought a general viewpoint on these occasions.

Each practice also returned a monthly check list of events associated with the computer, and was telephoned by a member of the Evaluation Team on a monthly basis. Seven of the practices received more detailed assessment. Methods used in these practices included (further details in the Interim Report):

- A A form to monitor repeat prescriptions, completed by the practice staff over a 1 week period before and 1 year after the arrival of the computer.
- B A questionnaire to assess patient views about repeat prescriptions, administered to patients before and 1 year after computer delivery.
- C Direct observations of procedures for repeat prescribing, including timings of each component of the procedures before and 1 year after delivery of the computer.
- D Direct observation of training sessions.

The detailed evaluation made use of a number of other sources of data. Co-ordinators encouraged practices to submit reports of progress after one year, and these were received from 48 practices. Members of the Evaluation Team attended meetings of the co-ordinators and a number of cluster meetings and consulted with the staff of the supplying companies in order to expand the perspective of the study. In addition the supplying companies provided assessments in Spring 1984 and again a year later of the number and type of queries raised with them by the practices.

1.4: Receipt of Evaluation Data

The Final Report is based on analysis of the following practice questionnaires and logs:

Table 2: Questionnaires and logs analysed for Final Report

Type	Time	Questionnaire/ Log	Possible Number*	Actual Number	%
LE	Before delivery	PP	140	134	95.7
		FPS1	140	102	72.9
		RP1	140	128	91.4
		RP2	140	130	92.9
		RP3	140	129	92.1
		RC1	140	125	89.3
		INST1	140	138	98.6
		ATT1	-	1595	-
		ATT2	-	1495	-
	After delivery (various times)	INST2	140	138	98.6
		INST3	140	137	97.9
		INST4	140	132	94.3
		INST5	140	120	85.7
		ATT2	-	664	-
	(Recurrent)	OP1	-	638	-
	(Recurrent)	NP1	-	142	-
	1 year after delivery	PP	124	105	84.5
		FPS2	124	85	68.5
		RP1	124	102	83.3
		RP2	124	105	84.5
		RP3	124	108	87.1
		RC1	124	106	85.5
		OP2	124	108	87.1
		C	124	102	83.3
		ATT2	-	1143	-
		ATT3	-	1160	-
	January 1984	PROGRESS	140	137	97.9
	December 1984	PROGRESS	138	137	99.3
DE	Before delivery	PRACTICE (PR1)	24	24	100
		STAFF (S1)	162	158	97.5
		DOCTORS (D1)	81	80	98.8
	3 months after delivery	PRACTICE (PR2)	24	24	100
		STAFF (S2)	165	145	87.9
		DOCTORS (D2)	81	74	91.4
	12 months after delivery	PRACTICE (PR3)	24	23	95.8
		STAFF (S3)	159	133	83.6
		DOCTORS (D3)	80	71	88.8

* Possible numbers represent the numbers of responses expected (where known). Only 124 practices had had the computer for 1 year or more by March 1985.

APPENDIX 2

OVERVIEW OF THE SCHEME

2.1: Practice Selection

The numbers of applications received were as follows:

Table 3: Numbers of scheme applications by area

Area	Number
England	850
Scotland	93
Wales	50
Northern Ireland	22

From these the PEG identified 6 English 'clusters' where most interest was shown. These were (associated urban centres shown in square brackets):

Table 4: English cluster areas and associated urban centres

West Midlands (WM) [Birmingham]	North West (NW) [Manchester]
East Anglia (EA) [Norwich]	South West (SW) [Exeter]
South East (SE) [London]	North East (NE) [Sunderland]

Following demonstrations of the systems practices were asked to confirm their interest. Selection of the 122 English practices to be offered systems was then made on an anonymous basis, giving preference to practices with greater than 80% NHS commitment and to those not already making use of a computer in the areas covered by the scheme. The numbers of systems allocated to each cluster were roughly in proportion to the numbers of practices who applied and an even distribution of practices by size and type of system was sought. The aim was also that the proportion of single handed, rural and non-training practices in the sample should approximate as far as possible to their proportion in General Practice as a whole.

Scotland (S-16 systems), Wales (W - 8 systems) and Northern Ireland (NI - 4 systems) were also regarded as clusters in their own right. Selection of practices in these areas was left to the Health Departments concerned.

2.2: Local Co-ordinators

General Practitioners with appropriate experience were invited to act as local co-ordinators in each cluster to help manage the administration and evaluation of the scheme and to provide support to their cluster members. The DTI agreed that co-ordinators should be supplied with computers paid for through central funds. The co-ordinators met as a group on a regular basis from the start of the scheme. They also kept in touch with their cluster members by visiting them and organising meetings of the practices in their clusters.

The following were appointed as local co-ordinators:

Table 5: Local co-ordinators, locations and clusters

Name	Location	Cluster
Dr G J Aitken	East Boldon	North East
Dr G M Clayton	Norwich	East Anglia
Dr M S Hall	Shebbear	South West
Dr S A P Jenkins	Bury	North West
Dr J F Milligan	Dudley	West Midlands
Dr D S Rainey	Randalstown	Northern Ireland
Dr M P Ryan	Livingston	Scotland
Dr T Silver	Mitcham	South East
Dr B W Turner	Bridgend	Wales

2.3: System Distribution

The distribution of systems by cluster, size and type of system, and location, size and training status of practice is shown in Tables 6, 7 and 8:

Table 6: Distribution of systems by cluster

WM	SW	NW	SE	EA	NE	S	W	NI	Total
19	25	20	17	16	15	16	8	4	140

Table 7: Distribution of systems by size and type of system received

BMDS				CAP			
Small	Medium	Large	Total	Small	Medium	Large	Total
18	47	10	75	5	20	40	65

Table 8: Distribution of systems by practice location, size and training status

	Rural	Urban	Size 1	Size 2	Size 3	T	NT
Numbers	22	118	24	63	53	61	79
Percentages	16%	84%	17%	45%	38%	44%	56%
Key:							
Urban = includes 'mixed', 'urban', and 'inner city'							
Size 1 = less than 3,000 patients							
Size 2 = 3,000 to 7,999 patients							
Size 3 = 8,000 or more patients							
T = training							
NT = not training							

Although exactly comparable figures are not available for British General Practice as a whole, it seems likely that the sample included fewer rural, small and non-training practices than would be expected if these groups had been represented in proportion to their actual numbers. For example 1983 figures for England and Wales indicate that 26% of GPs received rural practice allowances (and probably a higher proportion of practices). Similarly, 31% of practices were single handed (and thus probably a larger number were serving up to 3,000 patients since the average list size was 2,108). Finally, the proportion of training practices would appear to be about 19% in England and Wales overall, according to figures supplied to the Council for Post Graduate Medical Education by the Regional Advisors.

2.4: Practice Characteristics

Details of the participating practices are presented in Tables 9 and 10 (LE, PP, FPS1) [here and elsewhere the abbreviations are to source material tabulated in Appendices 1.3 and 1.4]:

Table 9: Pre-computer characteristics of 134 participating practices

Characteristics	% Practices
<u>Numbers of patients:</u>	
Less than 3,000	15.8
3,000 to 8,000	47.4
More than 8,000	36.8
Range 1651-27370; Mean 7482	
<u>Numbers of partners:</u>	
1	15.7
2 - 3	38.8
4 - 6	38.0
7 +	7.5
Maximum 17; Mean 3.6	
<u>Total administrative hours per month:</u>	
Less than 200	13.8
200 to 500	32.5
500 to 1,000	30.7
More than 1,000	13.0
Range 16-2328; Mean 607 (about 4 full time equivalents)	
<u>Type of manual records:</u>	
Lloyd George	74.8
A4	19.1
Other	6.1
<u>Age/Sex register in use:</u>	
Yes	75.9
No	24.1
<u>Repeat prescribing cards in use:</u>	
Yes	76.5
No	23.5

Table 10: Pre-computer financial details of 101 participating practices

Area of cost or payment	Range (£)	Mean (£)
Average cost per prescription	1.98-6.14	3.4
Average cost per person on NHS prescribing list	0.80-4.36	1.94
Payments for all immunisations in a sample quarter	0-1717	547

2.5: System Offers Declined

Thirty-five practices decided not to take up offers of systems. Of these more than a third (13) were in the South East region, with the others spread fairly evenly across the clusters. These practices were invited to complete a questionnaire indicating their reasons for withdrawal. Responses from the 23 practices who completed the questionnaire are summarised in Table 11 below:

Table 11: Reasons for declining offers of systems in 23 practices

Reason for declining offer	No of responses
Alternative system preferred	5
Finance	14
Partners not unanimous in decision	6
Dissatisfaction with the terms of the scheme	14
Alterations to premises unacceptable	3
Changes to practice organisation unacceptable	4
Other	6

Most practices (17) indicated more than one reason for withdrawal. The most common factors influencing their decision seem to have been financial and other dissatisfactions with the terms of the scheme. Many answers suggested that practices preferred to wait for cheaper, more effective systems to be developed. Other responses however reflected the practices' unreadiness in terms of prior organisation or other issues. A flavour of these replies may be gained from the following excerpts:

- A "There was a great deal of uncertainty about the scheme and the costs involved: costs in terms of finance and staff. We are a new practice and couldn't currently have afforded the cost. The large number of uncertainties led to us withdrawing."
- B "I thought the package rather expensive despite the generous subsidy. I am waiting for better systems to come available."
- C "Scheme not well thought out. Choice of only two systems - each expensive with limitations in capacity especially of software but also of hardware. At the current rate of progress in development of hard and software it was felt likely that we would be buying a model T Ford when the new Granada is just around the corner - at less cost."
- D "I'm sure that in the near future we will be looking for a computer system for our administration work, recall and possibly for prescriptions. We also have doubts as to the suitability of alternative systems offered. The installation of a computer would have caused too great an upheaval for our practice as we first had to make a greater effort to improve our notes etc. I think in the near future a computer more suitable to general practice and medical work will reach the market and if we had chosen a system in 1983 we would have regretted it later on."

- E "There seemed little point in exchanging our reasonably reliable, if simple, manual recall and prescription monitoring systems for the uncertainties of a computerised one until reliability was more assured. We were also disappointed that as a dispensing practice we would not be able to exercise stock control on the software provided with the Micro's Scheme."
- F "We did not feel that the benefits of the use of the particular system offered were sufficient to make the commitment of staff time to run the computer worthwhile. We are still in a way not ready for a computer in that we're still working on organising our medical records and setting up our manual age/sex register and disease index."
- G "Initially, the partners were in favour of the scheme by a small majority. When the details of the terms were sent to us in the letter of intent, we found ourselves unanimously against the scheme. All of us, including those in favour of the scheme, had reservations about the enormous task of putting information from 17,000 records on the computer. We all felt that the clause penalising a practice for not providing the department with certain unspecified information was inappropriate to a general practice situation. We could, for instance, foresee occasions, which do happen in general practice, where a sudden increase in workload, due to an epidemic such as 'flu', together with the possibility of one partner becoming ill at the same time, which would make it impossible to comply with such requests for information. Reading the letter of intent seemed to have the effect of amplifying all our reservations about the scheme."
- H "If the scheme had offered the cash instead of the rigid systems, based on the cost of the appropriate system envisaged (instead of offered) I think you would have encouraged a great deal of innovation and hard work offering a terrific range of ideas, experience and mishaps, which if then pooled would have pointed much more accurately to the sort of system your 'average GP' could use and find uses for."

2.6: Use of the Systems

Practices were asked to detail their use of the computer system one year after delivery. Responses were received as follows (LE, C):

Table 12: Procedures for which the computer was used 1 year after delivery (% making use, out of 108 practices)

Procedure	% Practices
Checking registration details	98.1
Printing repeat prescriptions	82.1
Facilitating screening or recall	74.1
Facilitating rubella recall	52.7
Facilitating recall for pre-school boosters	27.2

Doctors and staff in detailed evaluation practices were asked after 12 months how much of the task of introducing the computer and putting it to effective use had been completed. Percentage responses were as follows (DE, D3 Q61, S3 Q59):

Table 13: Extent of progress towards full use of the computer (% views of 71 doctors and 116 staff)

Extent of progress	% Doctors	% Staff
Hardly any	8.5	11.2
Less than half	49.3	18.1
About half	15.0	32.8
More than half	16.2	19.8
Nearly all	6.3	18.1

The progress interviews in December 1984 indicate the development of the use of the computers over the second year. Below are summarised percentage responses from 108 practices who had had the computer more than 12 months and 29 practices with less experience.

Table 14: Procedures for which computer was being used in December 1984 (% practices making use out of 108 with more and 29 with less than 12 months' computer experience)

Procedure	% practices	
	Less than 12 months' use	More than 12 months' use
All patients registered on the computer	90	94
Routinely printing repeat prescriptions	83	94
Entry of some other clinical information	59	79
Entry of an item of clinical information for more than 90% of relevant patients	21	40
Recall for cervical cytology	31	37
Recall for rubella	10	40

2.7: Cluster Meetings

Cluster meetings varied in frequency, style and content according to local circumstances. Some focused on particular problems arising from the use of the systems; others were more wide ranging in their scope. Difficulties were sometimes experienced in finding suitable locations and times to meet particularly in the more rural areas. Nor was it an easy task to build an atmosphere in which participants, both doctors and staff, with their varied interests and expertise, were able to be involved in, and benefit from, the discussion. There can however be little doubt that the cluster meetings provided important opportunities for practices to share experience with one another, the more so for staff who otherwise have little opportunity for interaction with their counterparts in other practices. Together with the co-ordinators' meetings they helped to provide a mechanism through which issues of general importance could be addressed, both in terms of negotiations with the supplying companies and in the formulation and exchange of appropriate advice among the practices. Practices were also encouraged to circulate annual reports of progress. This promoted reflection and review within the practice, and facilitated the sharing of experience.

Most clusters continued to meet after scheme support came to an end in March 1985. Some decided to continue as a closed group; others elected to involve practices outside the Micros scheme. In some of the more widely dispersed regions, sub-groups developed on a geographical basis.

Important opportunities in General Practice computing depend on groups of practices adopting common procedures to facilitate the co-ordination and comparison of data from more than one practice population. Practices may also be expected to benefit from a co-ordinated approach to suppliers and potential customers for practice-held information. The development of these activities is therefore of continuing interest.

APPENDIX 3

IMPLEMENTING THE SYSTEMS

3.1: Preparations for the Computer

All practices were asked about the alterations to practice premises required to accommodate the computer, and about enhancements to the systems purchased on delivery. Responses are tabulated in Table 15 (LE, INST1):

Table 15: Alterations to practice premises and system enhancements purchased on delivery (costs and % practices incurring cost, out of 138)

Type of alteration or enhancement	% practices incurring any cost	Range of costs (£)	Average for practices incurring any cost (£)
Structural alteration	26.8	0 - 5000	834
Electrical work	78.3	0 - 500	75
Furniture and fittings	70.3	0 - 900	144
Other expenses	24.6	0 - 692	165
All alterations	97.1	0 - 5280	431
Enhancements to systems	38.4	0 - 3836	992

The 24 detailed evaluation practices were asked about other preparations made for the computer (DE, PR2 Q2). Four took on additional staff and two increased the hours of existing staff. More than half of them (14) had made preparations for data conversion by checking registration details (6), compiling a register of repeat prescriptions (6) or starting to create patient summaries (2). Only three practices had made no such preparations.

Staff and doctors in these practices were also asked about discussions they had had about the computer before it was delivered. Responses are shown in Table 16 (DE, D2 Q4 Q5, S2 Q5 Q6):

Table 16: Meetings and discussions about the computer before delivery (% attending of 73 doctors and 131 staff)

Type of meeting or discussion	% Doctors	% Staff
Demonstrations by the computer suppliers	78.1	11.4
Visiting other practices with a computer	32.9	10.7
Meetings with computer suppliers at practice	67.1	13.7
Meetings with doctors	79.5	11.5
Informal discussions with doctors	79.5	29.0
Meetings with staff	46.6	6.1
Informal discussions with staff	83.6	45.7

Staff and doctors were asked how well prepared they felt for the arrival of the computer. Responses are shown in Table 17 below (DE, D2 Q6, S2 Q7):

Table 17: Extent of feeling prepared for the arrival of the computer (% views of 73 doctors and 131 staff)

Extent of feeling prepared	% Doctors	% Staff
Not at all prepared	9.6	48.1
Not very prepared	23.3	26.7
Reasonably prepared	56.2	21.4
Very prepared	11.0	3.8
Extremely prepared	-	-

3.2: Learning How to Use the Systems

The amount of training made available through the scheme varied between 3 and 5 days with larger practices receiving more training. The supplying companies differed fundamentally in the approaches they adopted to training. Although it had been agreed that, to save time and costs, training would be offered in a single block immediately after delivery of the computer, BMDS from the start encouraged the practices to have this training as a series of days phased over time. Later CAP also started to offer to hold back about a day's training for a second occasion. Practice comments (LE, INST4) indicated a considerable preference for training phased appropriately over time to match their rate of progress.

Differences were also apparent in the approaches to training adopted by the practices. Although the LE study (INST4) indicated that most (89%) nominated a key person to receive more intensive training than other practice members, there was considerable variation in the numbers of partners and staff receiving training, and in the amount of training received by those trained.

All practices were asked to assess doctor and staff satisfaction with training on a six point scale (0 to 5) from dissatisfied to very satisfied. Responses are shown in Table 18 below (LE, INST4):

Table 18: Satisfaction with training (% reports of doctor views by 116 practices and staff views by 122 practices)

Extent of satisfaction		% Practices	
		Doctor	Staff
Dissatisfied	(0-2)	9.4	9.8
Fairly satisfied	(3,4)	66.4	63.1
Very satisfied	(5)	24.1	29.0

In the detailed evaluation doctors and staff who were trained were also asked individually how training could have been improved. Responses are shown in Table 19 below (DE, D2 Q17, S2 Q17):

Table 19: Possible improvements in training (% views of 30 doctors and 57 staff)

Possible improvements	% Doctors	% Staff
Arrangements for 'off the job' training	30.0	45.6
More training	43.3	52.6
Clearer presentation by trainer	20.0	8.8
More widely spaced training sessions	63.3	21.1

Doctors and staff were also asked how good were the arrangements made by the practice to help people learn about the computer. Responses are shown in Table 20 below (DE, D2 Q19, S2 Q21):

Table 20: Evaluation of practice arrangements to help people learn about the computer (% views of 72 doctors and 134 staff)

View	% Doctors	% Staff
Not very good	15.3	60.4
Moderately good	20.8	13.4
Reasonably good	48.6	17.2
Very good	15.3	9.0
Extremely good	-	-

Many staff (71%) and doctors (48%) had not used the documentation made available by the suppliers (DE, D2 Q21, S2 Q23). Of those that had however only a minority were satisfied with them as is shown in Table 21 below (DE, D2 Q22, S2 Q24):

Table 21: Satisfaction with documentation (% views of 36 doctors and 47 staff)

Extent of satisfaction	% Doctors	% Staff
Dissatisfied	22.2	38.3
Neutral	47.2	27.7
Satisfied	30.6	34.0

Doctors and staff were asked 3 months and 12 months after delivery of their computer how important various methods were to them in learning how to use the system. Responses indicating their relative importance are summarised in Table 22 below (DE, D2 Q24, D3 Q57, S2 Q26, S3 Q57):

Table 22: Relative importance of various ways of learning to use the computer system (mean scores of 66 doctors and 108 staff after 3 months, and 51 doctors and 111 staff after 12 months)

Method of learning to use the computer	Mean scores (high = important)*			
	After 3 months		After 12 months	
	Doctors	Staff	Doctors	Staff
1 Help from other practice members	2.9	2.7	3.0	3.0
2 Time spent practising	2.4	2.8	3.0	3.0
3 Training from the computer supplier	2.4	2.6	2.4	2.0
4 Booklets or manuals from the supplier	2.1	2.0	2.1	1.7
5 Talking to people in other practices	2.2	1.4	2.2	1.5
6 Books or courses about computers	2.0	1.3	2.0	1.3
* Scores were from 1 (= not at all) to 5 (= extremely)				

3.3: Data Conversion

Practices were asked to detail which items of information they entered on the computer during their first run through of the manual records, and which items were entered on subsequent runs through. Their responses are displayed in Table 23 (LE, INST5):

Table 23: Phases of entry of information items (ranges and means across practices, numbers of practices in brackets)

Item of information	(n)	Range		Mean
		Min	Max	
Name	(118)	1	1	1.0
Address	(118)	1	2	1.0
Date of birth	(118)	1	5	1.1
NHS number	(117)	1	6	1.1
Telephone number	(101)	1	8	1.3
Postal code	(80)	1	8	1.3
Marital status	(101)	1	8	1.3
Occupation	(56)	1	8	2.0
Repeat prescription details	(113)	1	8	2.2
Cervical smear information	(72)	1	8	2.8
Family planning information	(49)	1	8	3.0
Free commentary	(20)	2	8	3.1
Immunisation state	(63)	2	8	3.2
Recall for diabetes, hypertension etc	(35)	2	8	3.8

Thus every practice entered the patient's name on the first run through of data entry, and the vast majority also entered address, date of birth and NHS number at the same time. However, although a few practices also entered details of repeat medication on the first run, the majority left this for the second phase of data entry. Similarly, immunization and recall status information was usually entered after details of repeat medication.

Practices were asked to specify who undertook the data conversion from the manual records to the computer files. Responses were as follows (LE, INST5):

Table 24: Methods of data conversion (% reports from 108 practices)

Method of data conversion	% Practices
Contracted out to supplier/bureau	16.6
Existing practice staff	87.0
New staff employed for this purpose	46.3

The amount of time per record required for record conversion clearly depends on many factors over and above the skill and experience of the operators involved and the ease of use of the computer system. Important amongst these are the state of the manual records, the amount of data taken from each record and the extent to which data is checked before, during and after entry. Measures of accuracy of data conversion were not available, but most practices seem to have paid particular attention to the accuracy of repeat medication entries. More than a quarter (27%) of the practices reported checking this data before, during and after entry, whereas the equivalent figure for registration details, such as address, was 7% (LE, INST5).

Details about the ranges of overall times taken for registration data conversion are given in Appendix 5.1. However, practice estimates of times per record are presented in Table 25. These are based on calculations by the practices of these times for the first phase of data conversion (LE, INST5), and average 4.6 minutes per record.

Table 25: Data conversion times per record in the first phase of data entry (% reports from 77 practices)

Time	% Practices
1 - 2 minutes	36.4
3 - 5 minutes	46.8
6 - 10 minutes	10.4
11 - 20 minutes	3.9
20 + minutes	3.9

Details of data conversion times for subsequent phases were somewhat incomplete, but 41 practices offered figures ranging up to 30 minutes per record and averaging 6.1 minutes. In many cases practices appear not to have made sufficient progress to estimate the time required.

It seems that the time required for data conversion was somewhat underestimated. Certainly, when doctors and staff in the detailed evaluation were asked after three months what the worst thing about the computer was, 41% of 61 doctors and 34% of 93 staff noted the time taken to input records (DE, D2, Q47, S2, Q47). The times taken may also have been influenced by the 20 pence per record grant towards record conversion which had to be claimed within 12 months of delivery.

3.4: Workload Changes

Practices were asked (LE, PP) to specify the numbers of hours worked by employed staff before and 1 year after computerisation. From these the numbers of hours worked by employed non-nursing staff were calculated. Although there was considerable individual variation, most practices showed staffing increases, and the overall average increased by 9%. The figures are summarised in Table 26:

Table 26: Non-nursing staffing rates (hours per week) in 78 practices before and 1 year after computerisation

	Before	After 1 year	Change	% Change
Examples of increases:				
small practice	180	292	+ 112	+ 62
large practice	1750	2215	+ 465	+ 27
Examples of decreases:				
small practice	304	204	- 100	- 33
large practice	1741	1493	- 248	- 14
Averages	644*	702*	+ 58	+ 9
* Statistically significant difference: $p < 0.001$				
(Here and in other tables, the 'p' values indicate the likelihood of the differences observed occurring by chance. Values of 'p' less than 0.05 are usually considered to be 'significant' i.e. that chance alone is unlikely to account for the findings).				

In the detailed evaluation staff and doctors were asked individually how their working hours per week had changed 3 and 12 months after the computer came (DE, D2 Q51, D3 Q48, S2 Q51, S3 Q52):

Table 27: Changes in working hours per week (% reports from 70 doctors and 123 staff after 3 months, and 71 doctors and 128 staff after 12 months)

Change	% Doctors		% Staff	
	3 mths	12 mths	3 mths	12 mths
Increased	33.3	22.5	31.7	20.3
No change	66.7	76.1	68.3	77.3
Decreased	-	1.4	-	2.3

3.5: Meetings and Discussions

Doctors and staff in the detailed evaluation were asked how the amount of time spent in meetings and informal discussions had changed 12 months after the computer came (DE, D3 Q49 Q50, S3 Q51 Q52):

Table 28: Changes in practice meetings and discussions 1 year after computerisation (% reports from 71 doctors and 120 staff)

Meetings and discussions	% respondents:		
	More	Same	Fewer
Doctors' reports:			
Among doctors	22.5	73.3	4.2
Between doctors and staff	42.3	56.3	1.4
Staff reports:			
Between doctors and staff	25.8	70.8	3.3
Among staff	25.6	71.1	3.3

Doctors and staff were also asked whether they would like to have more or fewer meetings (DE, D3 Q45, S3 Q45). About half of the doctors and staff thought the number was about right, but although the rest of the doctors were equally split between wanting more and fewer meetings, the remainder of the staff were unanimous in their view that there were not enough.

3.6: Practice Reports

In this section and similar sections in the other Appendices excerpts from practice reports are presented to illustrate individual experiences. Identifying details have been deleted, but the number of principals in the practice is given as background information.

Most practices made preparations for the arrival of the computer:

- A "Before its installation we had a few practice meetings attended by all the practice staff and doctors and we formed a working group which included myself, my partner, our secretary and one receptionist. We were uncertain of the patients' reaction to a computer in the practice, since a computer has generally been regarded as 'Big Brother' whose faithfulness and trust is always questioned. In the meeting we decided that I, my partner and the secretary would be responsible for the organising and running of the computer but that one more receptionist should be trained in case of emergencies. It was also decided that a poster should be displayed, for the benefit of the patients and the practice, inviting suggestions and criticisms prior to its installation." (2 principals)
- B "The implementation meeting with a representative of [the supplier] proved very useful and, as a result, it was decided to prepare a Drug Dictionary in advance and to initiate the system by immediately launching into repeat prescriptions. For two to three months prior to installation we compiled a list of all commonly used repeat prescription drugs which, with the aid of a Vu-File program on my son's Spectrum,

resulted in a cross referenced print-out of generic versus propriety names." (1 principal)

- C "Since September 1983, a member of staff who was to become the computer manager and responsible for entering the data on the computer spent ten hours a week tagging notes and arranging correspondence and reports in chronological order, adding post codes and telephone numbers. These latter were checked with patients when they attended the surgery, and the computer manager made several visits to the Family Practitioner Committee to check the surgery list against the cards held there." (1 principal)

Most practices were reasonably well satisfied with the training itself:

- D "We were all very pleased with this, the installation seemed quick and efficient, and R was very pleasant and helpful. We all seemed to gain enough knowledge to work the thing adequately." (4 principals)

Some felt it had been less adequate:

- E "We feel now that the training was insufficient. We feel that it would have been better to have had a shorter time at the beginning and more time later on as problems arose. We find that most of the training in the initial stages was about putting on the data and in fact the problems we now have are those with working the programmes and keeping things tidy inside the computer." (5 principals)

However, there was a general criticism of the documentation and practices often had difficulties in deciding how best to make effective use of the facilities:

- F "As far as the manual is concerned we feel it is not a very satisfactory manual, although it is much clearer than others I have seen. The index is not at all easy to use and there is a lot of difficulty in finding the information one needs." (5 principals)
- G "The compilation of summaries has not been so satisfactory. We received very little guidance from [the supplier] on how to use the indicator system. There were tales about the amazingly efficient systems developed by other users, but they were never more than anecdotal. Eventually we drew up our own list and began compiling summaries. It is a slow process which at the present rate of progress will take about two years to complete! A few weeks ago the visiting trainer informed us that the system we had devised would not work for identifying patients for recall and we have had to revise it. The previous trainer knew the system we were employing yet had allowed us to proceed unchecked." (3 principals)

Most practices started by entering registration data, but a few preferred to computerise repeat prescriptions first:

H "The computer arrived in April 1983, finding us still with some problems ... We had also decided to load our own details in order that the receptionists would quickly become familiar with the otherwise daunting machine. Familiarisation was much faster than we had anticipated: the boredom and frustration of loading 4,000+ patients' registration details was soon apparent. By hard work and overtime registration was completed by August 1983 - not bad, we thought, when taking holidays into account.

The additional registration of new patients is handled by my wife, who previously was responsible for maintaining the age/sex register. We still keep the manual system, just in case!

The next task was to load our repeat prescriptions. This entailed far more effort on the part of the doctors than was originally realised as we had to identify all our genuine repeats as distinct from the regular "casuals": we had no previous repeat control system in use - the doctor simply wrote out prescriptions as they were requested and the details were then entered on the patients' notes. The drug dictionary was finalised and loaded and repeat prescription details entered. It was decided to load all the patients details first and start the system running when all were loaded. We went into operation on January 1, 1984." (2 principals)

I "I decided initially to use the computer as fast as possible, so as soon as my staff could use the hardware I started loading drugs and generating repeat prescriptions. It took 6 months to load all 2,050 registrations and about 150 repeat prescriptions of the most regular attenders." (1 principal)

Effort was also needed both to ensure consistency in data entry and the continued updating of information:

J "It is important to ensure consistent entries by all users because variation in the way information is entered can make nonsense of subsequent searches. We have already found this when searching for 'Insulin' to find diabetics. This may be entered with a large or small 'I', and sometimes even as eg 'Actrapid'. Most information is now entered by our computer operator as she is so much more consistent than the rest of us!" (3 principals)

K "Clerical staff need to reorganise their time both for the data conversion phase and the ongoing daily usage. Our staff have done overtime for data conversion and as they are learning daily I feel it would be a mistake to get outside help yet. We have an increased number of staff meetings which are weekly at present." (3 principals)

L "The amount of time allocated for data input per week was 16 hours, this is now thought to be well below that required if increased input is to be maintained. This time is barely enough to update the machine and in consequence we are well behind our projections for the year (as stated in the previous annual report). It is also noted that a small room for the computer, away from the main office is preferable for accurate data input and obviously it is now felt that the system would be beneficial if semi-multi user, ie if data input was confined to one particular

place but data extraction could be performed a) in the general office and b) in the consulting room." (1 principal)

- M "I feel confident that our data base is of good quality and therefore that the updating process is a worthwhile chore. One worry was that initially the data base would be good and then gradually decay. The obvious benefits of the system have demonstrated the need for constant vigilance in record keeping and this has been, I hope, a useful spur to prevent such a decay." (4 principals)

RELIABILITY AND USABILITY4.1: Systems Reliability

Practices were asked in the January 1984 and December 1984 progress interviews to report on the number of days their computer had been out of action during 1983 and 1984 respectively. Their responses were normalised to give a rate per month of use for each period. These rates are summarised in Table 29 below:

Table 29: Numbers of days per month for which computers were out of action (reports from 110 practices for 1983 and from 137 practices for 1984)

Numbers of days out of action per month	% Practices	
	1983	1984
None	28	13
Less than half	29	45
Half to one	15	21
One to two	12	10
More than two	16	8
Range	0-14	0-7.75
Average number of days out of action per month	1.02 (12/year)	0.73 (9/year)

Overall the number of days lost went down, as did the range. However, there were fewer practices experiencing no days lost. Similar reductions were observed in information available from the recurrent logs of computer problems requested from all the practices (LE, OPl), from which the 1983 and 1984 rates of problems per month of use were 1.83 and 1.53 respectively.

4.2: Types of Problems

Some indication of the types of problems encountered may be derived from analysis of the OPl material for 1984 and from information made available by the supplying companies about practice initiated supplier contacts during 1984 and early 1985. This data related to all the scheme practices; one supplier provided information for six months from October 1984 and the other for twelve months from April 1984. Normalised rates per month of use are shown in Table 30:

Table 30: Computer problems (average rates per month of use from reports by 117 practices and 2 suppliers)

Problem	Average rates per month	
	Practice views	Supplier views
Hardware problems	0.41	0.62
Software problems	0.29	0.84
Operator errors*	0.04	(0.08)
General query (supplier)	-	0.83
Unclassified (by practice)	0.79	-
Total	1.52	2.34

* Information about this as a separate category was only available from one supplier, and the bracketed figure is for illustration only, and is also included in the 'general' category.

This data suggests some under-recording of problems by the practices, and their considerable uncertainty about the nature of problems (52% of which were unclassified). Operator errors do not seem to have been a substantial cause of the problems requiring contact with the supplier, but the practice uncertainty indicates their need for support in clarifying the nature of problems.

4.3: Hardware Problems

Practices were asked to enter an eventual diagnosis for the faults they had logged. From this, it was possible to calculate rates per month of use of various types of hardware problems and practice reported hardware replacement rates were also available. These suggest the relative extent of the problems experienced with the Walters printers by comparison with rates for other main items of hardware. Rates per 100 months' use for 1983 and 1984 combined are presented in Table 31 below, based on a total of 117 practices and 1268 months' use, of which 63 practices using Walters printers for 693 months (LE, OP1):

Table 31: Hardware faults and replacements (average rates per 100 months' use from reports by 117 practices)

Hardware	Average rates per 100 months	
	Faults	Replacements
Walters printers	13.1	7.9
Other printers	5.3	1.9
Disc/tape drives	6.1	2.9
Discs/tapes	8.8	2.3
CPU's	0.9	0.6
VDU's	2.5	0.2

4.4: Use of Back-up Facilities

Practices were asked how often they took back-up security copies of the complete patient file and the daily transaction file and how long the complete copy took to make. Responses are summarised in Table 32 (LE, OP2).

Table 32: Back-up procedures - frequency and time taken (practice means and ranges, numbers of practices in brackets)

	(n)	Mean	Range
Frequency of back-up (days) of:			
Complete patient file	(102)	8.2	1-35
Daily transaction file	(97)	2.3	1-30
Time taken for full back-up (hours)	(104)	1.2	0- 4

About 30% of practices were taking daily transaction file back-ups less often than daily; 25% were taking copies of the complete patient file less often than weekly; 31% said full back-up took longer than 2 hours.

At the same time, practices were asked whether problems were experienced taking back-up or restoring from back-up. A third (33%) of practices reported problems taking back-ups and a fifth (19%) problems in restoring from back-up. Practices were also asked in the December 1984 progress interviews whether they had used the back up facilities to restore the computer files, and, if so, why back up was needed. Responses are summarised in Tables 33 and 34 below:

Table 33: Use of back-up to restore computer (% reports from 136 practices of rates per year of use)

Rates per year of use	% Practices
Never	32
0 - 1 times	12
1 - 2 times	30
2 - 3 times	17
3 + times	9

Table 34: Reasons why back-up needed (% reports from 93 practices who used back-up to restore the computer)

Reasons why back-up needed	% Practices
System malfunction	89
Operator error	16
Damage or loss of computer (eg fire, theft)	4

At the same time, they were asked how many days work had been required to re-enter data lost due to problems with the computer since it had been delivered. These were normalised to give rates per year of computer use which are shown in Table 35. These figures relate to the first year or 18 months' use of the computer.

Table 35: Work needed to re-enter data lost due to computer breakdown (% reports from 132 practices of days needed per year of use)

Work needed (days per year of use)	% Practices
0 days per year of use	45
1- 2 days per year of use	21
3- 5 days per year of use	12
6-10 days per year of use	12
11-20 days per year of use	5
20 + days per year of use	5
Maximum: 92 days per year of use	

4.5: System Support

Practices in the detailed evaluation were asked 3 months and 12 months after the computer had been installed how effective the computer suppliers or their agents had been in solving hardware and software problems. Responses are summarised in Table 36 (DE, PR2 Q54 Q58, PR3 Q45 Q49):

Table 36: Effectiveness of suppliers in solving hardware and software problems (reports about hardware from 19 practices after 3 months and 21 after 12 months, about software from 24 practices after 3 months and 23 after 12 months)

Effectiveness rating	Numbers of practices			
	Hardware		Software	
	After 3 mths	After 12 mths	After 3 mths	After 12 mths
Not at all effective	0	1	2	2
Not very effective	1	6	3	2
Reasonably effective	9	9	7	8
Very effective	6	4	8	7
Extremely effective	3	1	4	3

All practices were asked in the OPl fault logs how long it took for repairs to be completed. Analysis of figures from 117 practices covering 1268 months of use during 1983 and 1984 indicated 183 occasions on which practices had to wait more than 24 hours (more than a quarter of the 695 times practices reported their computer completely out of action). This represents an average of about 0.14 per month of use or about once every 7 months. Whereas many practices never experienced these difficulties, others reported recurrent delays, sometimes for two or three weeks.

Practices were also asked in the December 1984 progress interviews about the routine servicing of equipment as a preventive measure. Normalised rates per year of use are summarised in Table 37:

Table 37: Preventive maintenance calls (% reports from 132 practices of rates per year of use)

Rate per year of use	% Practices
0 per year of use	64.4
1 per year of use	10.6
2 per year of use	16.7
3-5 per year of use	5.3
5 + per year of use	3.0

4.6: User Views

Doctors and ancillary staff in the detailed evaluation who had used the computer to some extent were asked how they rated various features of the computer system one year after it had been installed. Responses are summarised in Table 38 (DE, D3 Q70, S3 Q65):

Table 38: User ratings of various aspects of the systems (% reports from 34 doctors and 82 staff)

	% Doctors			% Staff		
	Poor/ Moderate	Not Sure	Fairly/ Very Good	Poor/ Moderate	Not Sure	Fairly/ Very Good
Screen legibility	15	3	82	15	2	83
Ease of keyboard use	23	3	74	10	1	89
Straightforwardness of procedures	53	3	44	37	5	58
Response speeds	62	6	32	64	1	35
Reliability	73	9	18	48	7	45
Ease of recovery from errors	76	12	12	59	13	28
Ease of finding out reasons for problems	73	9	18	65	16	19

4.7: Practice Reports

Some practices had few reliability problems:

- A "Throughout these processes we have come across very few difficulties regarding the operation of the computer, and on very few occasions the staff or myself had to contact the company. It is also true that fortunately we have never had any sort of problem with our hardware." (1 principal)
- B "We have had remarkably little in the way of problems with our installation and ... where problems have arisen, which have usually only involved a telephone call to [the suppliers], these have been dealt with promptly and very efficiently by staff whom our computer operator has found are always very polite and accommodating." (5 principals)

Others experienced greater difficulties:

- C "The main difficulties have been with the speed of the computer and the problems with the printer. Hence we now have a second printer to which we can change when necessary." (3 principals)

D "Our main problems have been with regards to the hardware. Uncharacteristically our printer has been relatively troublefree but we have had a number of crashes, one of which was somewhat catastrophic in that it caused the loss of a considerable amount of data. Unfortunately the computer had allowed integrity checks as being reported as normal, even though incomplete data has been stored on the floppy disc. This has meant that when we had a serious hard disc fault and came to restore our information from floppy discs we found we had lost data." (4 principals)

E "We have been most disappointed with the performance of this machine although at first it was very difficult to be sure that the problem was not due to operator error and inexperience. This uncertainty contributed to the time lag before we became convinced that our present machine was faulty. The defect is subtle and so far has not been possible to trace and fix." (2 principals)

Such difficulties made some practices reluctant to become dependent upon their computer:

F "Recent events, however, have caused us to be relieved that we have not allowed ourselves to become more dependent on the equipment. In the early months of introduction of the computer many minor operating faults emerged and phone calls to [the supplier] were not infrequent. Our problems were always dealt with courteously and efficiently and the errors rectified fairly easily. But in February we ran into a series of problems which [the supplier] was unable to rectify. Eventually the equipment became unusable and it remained out of action for a total of three weeks. The fault has now been rectified and for the last three weeks everything has been running smoothly, but the experience has made us wary of becoming reliant on the equipment." (3 principals)

Opinions about the usability of the systems varied, but in general as the practices gained experience they became more aware of shortcomings and potential improvements:

A "The hardware and the software continue to give excellent results." (1 principal)

B "The software has behaved impeccably throughout and any shortcomings have been due to disc saturation ... As widely predicted, any floppy disc based system is totally unsuited to general practice usage." (1 principal)

C "One of the main problems we have at present is that the system as it stands with one terminal is not adequate to fulfil the amount of work we carry out on the computer daily. This must take into account that we have not been able as yet to use the computer for any other function as for example recall for immunisations, etc. This problem of course, can be overcome by updating the computer hardware adding an extra terminal but this will also require updating the software. The cost for this amendment is in the region of £2,000." (3 principals)

- D "As yet we haven't fully loaded the computer and this system hasn't been operational, but, I suppose like many other users of multiple VDU's, we have noticed how incredibly slow the response is when both are being used at the same time for different purposes, and we seriously wonder the validity of having two VDU's at considerable expense, when both used together are half as fast as one, ie no gain." (4 principals)
- E "Software: Certainly a few grumbles here, most of which are already known about. Apart from minor style matters (layout and presentation of information, prescription side slips etc), the main problem we have come up against is a lack of flexibility on recording, recall and search procedures. To paraphrase this - when we have a clever idea, why won't the damn machine do what we want?! I do know however that software is expensive and that individually designed software would be prohibitively so. It is a pity that we can not write in our own program modifications (or could we if we knew enough?)." (3 principals)
- F "However, we have had several problems. Notably to time taken each evening 'dumping' the day's work, which has encroached upon the usefulness of having computer held information, because it becomes inaccessible for longer and longer periods. The processing of our amount of data is almost too much for the hardware even before we have got it all on." (12 principals)
- G "The degree to which any system accommodates itself to the user rather than expecting the user to adapt to it varies enormously and in large part determines how pleasant and easy it is to use on an everyday basis. [Our system] fails on this score on many irritating, minor points. To list a few of the major ones:
- For several search routines it will not print its lists in anything other than numerical order. This renders large listings almost useless. It would be easy to include an option for alphabetical listing (it's hard to think of ANY use for numerical listings in this context).
- It currently will not print a complete practice list. This is quite remarkable.
- When selecting searches it is often quite hard to tell from the on-screen documentation exactly what it is you are ordering and whether there is a final opt out clause. Without these two it is only too easy to embark on searches that turn out to be exhaustive (and exhausting!).
- User friendliness is not a favour done by programme writers but a right that all customers should be able to expect. By and large making systems accessible and friendly is a question of time and money and hardly ever impossible for technical reasons. A lot could be done to improve this one." (8 principals)
- H "All in all I think the system is quite a good one but it seems to me that [the suppliers] haven't done their homework on the specific needs and requirements necessary for General Practitioners." (4 principals)

Since these reports were written the suppliers have used the feedback to develop and issue updates to their software, although not always as promptly as the practices desired:

- I "One major disappointment has been the delay in getting new ideas through to [the suppliers] translated into action." (4 principals)

PATIENT REGISTRATION5.1: Data Conversion

Figures given in Appendix 3.3 suggest about one sixth of practices commissioned a data bureau either directly or through the supplying company, or had registration records directly converted from FPC or Health Board computerised registers. Some of these were dissatisfied with the service they received, but others made no such complaints. However, if the amount of time for completion of data entry for registration as reported by these practices is examined, it may be seen that further work was often required. Figures averaging 12 weeks per practice from 16 practices reported to have used these methods are presented in Table 39 (LE, Progress, December 1984):

Table 39: Time taken to complete registration data conversion by practices who commissioned outside help (numbers of practices)

Time taken (weeks)	Number of Practices
0- 4 weeks	7
5-12 weeks	4
14-26 weeks	2
27-52 weeks	3

Where practices completed registration data conversion themselves, rather longer periods of time were needed. Table 40 presents details from 110 such practices (LE, Progress, December 1984). The average length of time required was 24 weeks, and the maximum recorded was 63 weeks.

Table 40: Time taken to complete registration data conversion by practices who did it themselves (% reports from 110 practices)

Time taken (weeks)	% Practices
0- 4 weeks	4.5
5-13 weeks	18.1
14-26 weeks	40.0
27-52 weeks	31.8
53 + weeks	5.6

No measures of accuracy were available, and so further comparison between these methods depends on informal observations. Additional details about data conversion are presented in Appendix 3.3.

5.2: Use of the Registration Facilities

All the detailed evaluation practices registered new patients on the computer, although half of them (12) continued to maintain some other manual record of new registrations (DE, PR3 Q30). However, the vast majority of practices (87%) said that the computer was routinely used to help ascertain patient registration details (DE, PR3 Q27).

When individual staff were asked how much they used the computer terminal to check registration as compared with a manual age/sex file, their answers indicated that the computer was used rather more often by most, although many continued to use the manual methods to a substantial degree (DE, S3 Q7):

Table 41: Extent of use of computer and manual methods for checking registration details (% reports from 117 staff)

Extent of use	% staff	
	Computer terminal	Manual age/sex
Not at all	38.1	48.7
A little	25.4	26.5
A fair bit	17.8	20.8
A great deal	19.6	4.3

5.3: Attitudes to Use

In the light evaluation doctors and staff were asked if the computer had made running a registration system easier or harder. Responses are shown in Table 42 (LE, ATT3):

Table 42: Impact of computer on registration procedures (% reports by 382 doctors and 565 staff)

View	Rating*	% Doctors	% Staff
Made the job easier	(1)	80.1	69.7
No change	(2)	17.8	24.4
Made the job harder	(3)	2.1	5.8
Mean ratings*		1.22**	1.36**
* Rating scores in brackets in this and subsequent tables represent the value given to the adjacent response. Mean ratings therefore indicate average responses.			
** Statistically significant difference: $p < 0.001$			

In the detailed evaluation staff and doctors were asked how satisfied they were with methods of maintaining registration details before and 1 year after computerisation (DE, D1 Q8, D3 Q4, S1 Q11, S3 Q3):

Table 43: Satisfaction ratings for manual and computer registration methods (% reports from 80 doctors and 137 staff before and 71 doctors and 144 staff 1 year after computerisation)

Extent of satisfaction	% Doctors		% Staff	
	Manual	Computer	Manual	Computer
Dissatisfied	26.3	8.5	5.8	8.0
Neutral	17.5	7.0	8.0	11.3
Satisfied	56.3	84.5	86.2	80.7

Doctors became significantly more satisfied ($p < 0.002$), but staff did not. On direct comparative questions, however, about two thirds of both doctors and staff said they preferred the computer system for registering patients, and very few thought it worse than the previous manual methods (DE, D3 Q6, S3 Q10).

5.4: Practice Reports

The time taken to register patients depended on the number to be registered and the strategy adopted by the practice:

- A "We have entered all our patients within a period of approximately 2 months. However, it has taken another 6 months approximately before all the details were checked and corrected." (3 principals)
- B "A single-handed doctor and part-time secretary working largely in their own time cannot register a whole practice within six months. Despite the above, it is considered that it is more practicable and more interesting to load patients' data at the same time as working the system within the practice." (1 principal)
- C "The registration details of the 2,500 patients were entered on the computer in under two months." (1 principal)
- D "We have registered over 22,000 patients [in 15 months], and still have about 8,000 to do. This is complicated by an annual turnover of about 1,000 each October when the University year starts, as well as a very constant flux of patients throughout the year, so the number to be registered is well over the actual practice list size." (12 principals)

E "Things seemed to proceed very slowly for a while once the initial enthusiasm had abated a bit, and after a while it became obvious that some extra action was going to be required, unless we still wanted to be registering patients in 1988! Various means were suggested but eventually we decided to lean heavily on the goodwill of the office staff, who put in a large amount of overtime over a period of 2-3 months and got the whole practice registered (8,500+ patients). This was a Herculean effort and was funded by the DOI reimbursement scheme." (3 principals)

F "Input of patient registration details was arranged through [the supplier] and carried out with acceptable efficiency. There were errors, but we have not found a great number." (3 principals)

A few practices were fortunate that their FPC or Health Board could provide the necessary information in machine readable form:

G "On arrival the computer was already loaded with 3170 patient files by automatic transfer from the [FPC] Master Patient Index; a further 400 patients registered through other FPC's were loaded by the operator during the next six weeks." (2 principals)

H "The basic patient data was transferred directly from our family practitioner committee computer to our computer. Our family practitioner committee use a unique number made up of the date of birth and a four digit number in their 10 digit computer number. We were able to use the year of birth and the four digit number as our six digits. We are thus able to make up the family practitioner number by adding the day and month of birth to the year of birth." (5 principals)

Practices made various uses of the computer registration facilities:

I "All patients are registered on the computer and their registration details are kept as up to date and accurate as possible. The progress of notes awaited from the Family Practitioner Services are checked at 6 monthly intervals and a summary sheet is inserted in the notes when they arrive. The computer is positioned in the office and is used regularly by all reception and secretarial staff for checking registration details." (3 principals)

J "The computer has been quite useful in reorganising of patient files eg quite a number of patients were found to be receiving treatment at our surgery who were not in fact registered with us." (5 principals)

K "All data loaded including post codes and verified with FPC print out. Surprisingly little discrepancy over names and numbers of patients on the list. Address discrepancy is of the order of 5% which I think is a credit to the efficiency of all my office staff over the years!" (1 principal)

- L "Using different registration categories, R for registered, N for those for whom we had received FD7B or FD8B and blank for those whose medical cards had been sent to the FPC and whose medical records were still to come, we were able to produce lists on the computer for these categories 'N' and 'blank' and send them to the FPC, drawing their attention to those whose notes we had been awaiting much longer than the usual time."
(1 principal)

REPEAT PRESCRIBING6.1: Objectives

Doctors and staff in the detailed evaluation were asked to what extent they thought their manual repeat prescribing systems could be improved (DE, D1 Q44, S1 Q47). About two thirds (64%) of the 80 doctors asked felt there was fair or considerable scope for improvement, although only about a fifth (19%) of the 134 staff answering held this view.

They were also asked to specify what sorts of improvements could be made. Responses are summarised in Table 44 (DE, D1 Q45, S1 Q48):

Table 44: Potential improvements to manual repeat prescribing procedures (% reports by 80 doctors and 108 staff)

Potential improvement	% Doctors	% Staff
1 Control the issue of repeats more tightly	44	49
2 Decrease time taken to prepare repeats	40	37
3 Know more about the pattern of repeat prescribing in the practice as a whole	56	24
4 Respond more flexibly to patients' requests	15	13
5 Other	16	12

The weaknesses most commonly identified by both doctors and staff concerned safety (1), efficiency (2) and audit (3).

6.2: Efficiency

The time taken to produce a repeat prescription depends to a large extent on the procedures adopted within the practice to check eligibility, produce the script and record its issue. In some practices doctors are significantly involved in all parts of this process; however in most these tasks are largely delegated to ancillary staff. Of the 24 detailed evaluation practices in only 2 were doctors personally involved in the production of routine repeat prescriptions. Generally therefore significant savings in

doctor time cannot usually be expected through computerisation, although since many doctors said they checked repeat prescriptions before signing less than before (see Appendix 6.6) a small saving may sometimes be possible.

Estimates of the amount of time taken for the preparation of repeat prescriptions by ancillary staff were available at 5 detailed evaluation practices. They were based on observation of the changes in the individual procedures involved before and after computerisation. These included checking eligibility, producing the repeat prescription and recording its issue. Certain elements were therefore excluded from the comparison, for example, receiving the patient's request, dispensing medication (in dispensing practices) and issuing the script or medication to the patient. Doctors' checking and signing times were also omitted, as was the time taken to pull and refile notes, if common to both manual and computer procedures (practices B, C, E below). In addition no allowance was made for computer updating, housekeeping or maintenance, and the times shown in Table 45 for computer repeat prescriptions are to that extent under-estimates.

Table 45: Ancillary staff time taken per repeat prescription using manual and computer methods (average observations in 5 practices)

Method	Average times (seconds)				
	A	B	C	D	E
Manual	119	142	42	74	135
Computer	33	221	92	107	100

If a significant step in the production process is eliminated as a result of computerisation then time savings can be made. For example, at Practice A it was decided that it was no longer necessary to check requests for repeat medication against the patients' notes since the computer now contained the information necessary to regulate issue of scripts. The time saving that occurred at this practice can thus be mainly accounted for by the discontinuation of pulling and using notes. The majority of these practices however did not feel able to take this step, preferring to maintain a parallel manual record of repeat prescribing.

The introduction of the computer can also create steps additional to previous manual procedures. For example, Practice B checked eligibility against both computer record and patient notes and when the medication was changed printed out the revised details and pasted them into the patient's notes. Extra steps also resulted at Practices C and D. These were dispensing practices whose normal manual procedure had been to write the request directly onto the FP10, dispense the medication and mark up the prescription with the dispensing information (eg pack size) immediately. When the computer was used requests were noted, medication dispensed and only subsequently were the prescriptions ordered and printed on the computer, and then marked up with dispensing information. These additional

steps probably account for the increases in the time taken to produce repeat prescriptions at these three practices.

The time reductions observed at Practice E may in part be due to the practice choosing to reorganise their office arrangements, so that one of the receptionists was responsible during a particular week for the production of all repeat prescriptions. Previously, separate receptionists had been responsible for the scripts of each doctor and this work was intermingled with their other duties. Although the computer may have catalysed the review of office procedures, this change could have been instituted within a manual system.

The production times given in the table do not take into account the 'house-keeping' activities associated with the repeat prescribing (archiving and back-up procedures, changing paper in the printer, updating medication at times other than issue). For example, these additional tasks were estimated to take approximately 200 minutes per week in Practice E. Since the practice processes on average 520 repeat prescriptions per week this represents an overhead of some 23 seconds per script. Although this does not allow for other uses of the computer (only patient registration at Practice E), it also omits the time needed to deal with computer breakdowns. Overall, these overheads probably eliminate most of the observed time reductions.

Figures were not obtained from the other two practices involved in this part of the study. However, significant changes in the processing time are unlikely to have occurred, because relatively few prescriptions were printed on the computer in these practices. In one, there were very few repeat prescriptions at all (less than 5 a day), and in the other, the majority (75%) were not computerised. No comparative timings were taken for the remaining quarter, which were for patients on stable, chronic repeat medication. These had been 'pre-written' in anticipation of the patient's request, and were later 'pre-printed' on the computer.

Thus in the first year of use it seems that the computer itself had little effect on the time taken to produce repeat prescriptions. Much more important was whether the computer procedures eliminated part of previous manual procedures or added steps to them. This however depends on the choices made by the practice involved, and in particular whether manual recording systems are maintained, which seems likely while doctors continue to rely on manual notes during the consultation.

6.3: User Views

Doctors and staff were asked in all the practices how the introduction of the computer had affected procedures for repeat prescribing. Both thought it had made the job easier, and doctors were more positive than staff. Figures are summarised in Table 46 (LE, ATT3):

Table 46: Impact of computer on repeat prescribing procedures (% reports by 366 doctors and 551 staff)

View	Rating	% Doctors	% Staff
Made the job easier	(1)	78	67
No change	(2)	15	17
Made the job harder	(3)	7	16
Mean ratings		1.29*	1.48*
* Statistically significant difference: $p < 0.001$			

Similar views were expressed in the detailed evaluation practices. However, these views should be considered in conjunction with responses to another question asking about absolute standards of satisfaction with methods for repeat prescribing before and after computerisation. Although doctors became more satisfied, more mixed views among the staff were apparent with no overall improvement (DE, D1 Q40, D3 Q32, S1 Q43, S3 Q32):

Table 47: Satisfaction with manual and computer repeat prescribing procedures (% reports by 80 doctors and 136 staff before computerisation and 69 doctors and 103 staff 1 year afterwards)

Extent of satisfaction	Rating	% Doctors		% Staff	
		Manual	Computer	Manual	Computer
Very satisfied	(1)	15.0	21.7	38.2	21.4
Fairly satisfied	(2)	51.3	66.7	47.8	58.3
Neutral	(3)	7.5	5.8	4.4	12.6
Rather dissatisfied	(4)	22.5	4.3	9.6	5.8
Very dissatisfied	(5)	3.8	1.4	-	1.9
Mean ratings		2.5*	2.0*	1.9	2.1
* Statistically significant difference: $p < 0.001$					

6.4: Rules and Turnround Time

Evidence that practices were adopting more systematic rules for repeat prescribing derives from questions all practices were asked about their repeat prescribing procedures. Responses are summarised in Table 48 (LE, RP3):

Table 48: Repeat prescription rules in manual and computer systems (% reports from 99 practices)

Rules	% practices	
	Manual	Computer
Repeat prescription rule in the practice which patients are clearly aware of	85*	94*
Authorising document for repeat prescriptions (e.g. card)	79	83
Repeats allowable by telephone as well as in person	79*	71*
* Statistically significant differences: $p < 0.032$		

Practices were more likely to have explicit rules, and less likely to allow repeat prescriptions to be requested by telephone.

Practices were asked about changes in procedures after computerisation. Of 133 responses 28 noted a change in the amount of notice that patients were required to give when requesting a repeat prescription. Of the 23 of these that indicated the direction of the change 17 (74%) said that it had increased. Additional evidence of increased turnaround time comes from direct surveys in the light and detailed evaluations. All practices were asked to log repeat prescriptions issued in a sample week, and to indicate the amount of time needed before they were available. Results showing a slight increase after computerisation are summarised in Table 49 (LE, RP2):

Table 49: Proportions of repeat prescriptions available within the time periods specified using manual and computer methods (averages from 83 practices)

Time period (hours)	% repeat prescriptions	
	Manual	Computer
Less than 1 hour	17.1*	9.7*
1 - 4 hours	39.0	32.4
5 - 12 hours	19.2	24.6
13 - 24 hours	22.2	26.1
25 - 48 hours	5.3	4.4
* Statistically significant difference: $p = 0.029$		

A similar survey in the detailed evaluation practices showed similar effects.

6.5: Patient Views

Patients at 7 detailed evaluation practices were asked about their views on the repeat prescribing service they received. Except in the case of Practice G, 100 questionnaires were administered by post both before and after computerisation. At Practice G, 48 questionnaires sent out before computerisation and 65 afterwards. The response rates are shown in Table 50:

Table 50: Patient response rates at 7 practices to a survey before and 1 year after computerisation (%)

Practice	% response rates	
	Before	After
A	84	66
B	71	82
C	83	80
D	76	35
E	72	78
F	67	62
G	73	60

Two practices were subsequently excluded from the analysis: (i) Practice C, where only 25% of responses after computerisation were from patients who had received computer printed repeat prescriptions, and (ii) Practice D, because of the low response rate after computerisation. Differences between practices were controlled for in the analysis.

Generally patients were very satisfied with the service they received both before and after computerisation as Table 51 indicates:

Table 51: Satisfaction with manual and computer repeat prescribing services (% reports from 326 patients before computerisation and 324 1 year afterwards)

Extent of satisfaction	Rating	% Patients	
		Manual	Computer
Very satisfied	(1)	75.8	76.5
Fairly satisfied	(2)	17.2	15.7
Neither satisfied nor dissatisfied	(3)	2.8	4.0
Rather dissatisfied	(4)	2.8	2.2
Very dissatisfied	(5)	1.5	1.5
Mean ratings		1.37	1.36

Patients receiving computerised repeat prescriptions did however report a longer time period between requesting and being able to collect their repeat prescription than patients questioned before computerisation.

Table 52: Length of waiting time for repeat prescriptions in manual and computer systems (% reports from 325 patients before computerisation and 318 1 year afterwards)

Time	Rating	% Patients	
		Manual	Computer
Less than an hour	(1)	22.5	19.9
A few hours	(2)	15.7	11.9
Overnight	(3)	50.2	36.2
Two days or more	(4)	11.7	33.0
Mean ratings		2.51*	2.84*
* Statistically significant difference: $p < 0.001$			

Patients were also asked about the type of advice they received with their repeat prescription. Although the majority stated that they were given no advice at all, patients questioned after computerisation were more likely to receive advice in written/printed form.

Table 53: Forms of advice received with repeat prescriptions in manual and computer systems (% reports from 323 patients before computerisation and 316 1 year afterwards)

Advice	% Patients	
	Manual	Computer
None	69.7*	60.1*
From the staff	8.0	8.9
In written/printed form	18.9*	28.2*
Both	3.4	2.8
* Statistically significant difference: $p = 0.04$		

Patients in non-dispensing practices were asked about the legibility of the repeat prescriptions they received. Although the majority of patients both before and after computerisation said that their scripts were reasonably or very easy to read, patients questioned after the computer was installed were more likely to report this.

Table 54: Legibility of repeat prescriptions in manual and computer systems (% reports from 185 patients before computerisation and 167 1 year afterwards)

Extent of legibility	Rating	% Patients	
		Manual	Computer
Not at all legible	(1)	5.1	5.8
Not very legible	(2)	5.1	5.2
Moderately legible	(3)	15.4	7.7
Reasonably legible	(4)	38.9	24.5
Very legible	(5)	35.4	56.8
Mean ratings		3.94*	4.21*
* Statistically significant difference: $p = 0.04$			

6.6: Safety

No direct measures of safety were available although observations in the detailed evaluation indicated that it was common for ancillary staff to override programmed constraints on issue. Moreover ancillary staff reported that the computer record was more likely to be out of date than the manual record had been previously, as Table 55 indicates (DE, S1 Q32, S3 Q21):

Table 55: Frequency of manual and computer repeat prescriptions records being found out of date (% reports from 138 staff before computerisation and 103 1 year afterwards)

Frequency	Rating	% Staff	
		Manual	Computer
Hardly ever	(1)	61.5	42.7
Once or twice a month	(2)	20.8	30.1
Once or twice a week	(3)	13.8	17.5
Once or twice a day	(4)	2.3	4.9
More often than this	(5)	1.5	4.9
Mean ratings		1.6*	2.0*
* Statistically significant difference: $p = 0.032$			

However both doctors and ancillary staff asked in the detailed evaluation thought the computer procedures for repeat prescriptions were safer. Responses are summarised in Table 56 (DE, D3 Q29, S3 Q39):

Table 56: Impact of computer on safety of repeat prescription procedures (% reports from 69 doctors and 96 staff)

View	% Doctors	% Staff
Much more safe	15.9	15.6
Rather more safe	47.8	25.0
About the same	33.3	52.1
Rather less safe	2.5	5.2
Much less safe	-	2.1

These figures should be considered alongside the more direct comparison in which doctors and staff were asked before and after computerisation about the safety of the repeat prescribing procedures. These suggest that it is only the doctors who perceive a true increase in safety, as Table 57 indicates (DE, D1 Q36, D3 Q28, S1 Q38, S3 Q27):

Table 57: Safety of manual and computer repeat prescribing procedures (% reports from 80 doctors and 136 staff before computerisation and 69 doctors and 103 staff 1 year afterwards)

View about safety	Rating	% Doctors		% Staff	
		Manual	Computer	Manual	Computer
Not very safe	(1)	3.8	-	2.2	1.9
Moderately safe	(2)	17.5	14.3	12.6	9.5
Reasonably safe	(3)	51.3	42.9	41.5	44.8
Very safe	(4)	26.2	41.4	36.3	42.9
Completely safe	(5)	1.2	1.4	7.4	1.0
Mean ratings		3.0*	3.3*	3.3	3.3
* Statistically significant difference: $p < 0.001$					

Perhaps as a result of feeling that the procedures were safer doctors reported checking the prescription less than before computerisation. They were asked whether they were checking repeat prescriptions more or less than a year previously before the computer was installed, and again 12 months later. Responses are summarised in Table 58 (DE, D1 Q35, D3 Q27):

Table 58: Relative amount of checking repeat prescriptions before signing compared to a year previously in manual and computer systems (% reports from 75 doctors before computerisation and 69 1 year afterwards)

Relative amount of checking	Rating	% Doctors	
		Manual	Computer
Much more than a year ago	(1)	6.7	2.9
Rather more than a year ago	(2)	22.7	8.7
About the same	(3)	69.3	59.4
Rather less than a year ago	(4)	1.3	21.7
Much less than a year ago	(5)	-	7.2
Mean ratings		2.7*	3.2*
* Statistically significant difference: $p < 0.001$.			

6.7: Practice Reports

Most practices used the computer to print repeat prescriptions:

- A "Just over 1,000 patients have computerised medication records. Of 'unseen' repeat prescriptions approximately 70% are printed, 30% hand-written. Patients are asked to bring in the tear-off slip and prescriptions are printed out and signed once a day. If the patient wishes the prescription can be sent around to the local chemists after signing and they will prepare the drugs for collection. All prescription requests received by 11am are printed, signed and ready for collection from the surgery or the chemist by 2.30pm the same day." (4 principals)
- B "The computer manager entered details of repeat prescriptions as the patients requested them at the same time from the carbon copies [made previously by the doctor]. Prescriptions for about 75% of the repeat items requested are now produced on the computer." (1 principal)
- C "Over the past month we have put on all our repeat prescribing information, which was lost and we are again attempting to get a further print-out. However, the installation of the new machine apparently was not compatible with the current printer and so we are again unable to print out our seven hundred and fifty repeat prescriptions, which have been printed on one day each month. This has revolutionized the practice, in so far as we no longer take telephone calls, or repeat prescribing cards for people to get their items, and have stipulated that only full prescriptions are issued. This has relieved a lot of our receptionists' time as well as freeing the telephone. The once a month prescriptions are a fairly formidable task, accomplished with a stiff drink on a quiet evening." (2 principals)

Difficulties of various kinds were also experienced:

- D "We previously had a repeat prescribing systems using cards, which the patient returned. We are in the process of computerising this information and have immediately run into problems with lack of space for each item and also for the number of items that we can prescribe." (4 principals)
- E "From Day 1, when the patients requested repeat prescriptions the scripts were hand-written, but instead of being re-filed the notes were put aside so that all the medication details could be entered on each patient's computer record by one of the doctors. Not surprisingly this soon resulted in huge piles of records awaiting computerisation. Eventually one partner attempted to clear the backlog by coming in when the Health Centre was closed in the evenings and at weekends. This was a time-consuming chore which tested his dedication and by the end of the first year our repeat prescription file was still far from complete." (3 principals)
- F "Repeat prescription programme used intensively. We completely disregard time warnings since they are poorly set up. The very frustrating five and half months when this programme ran painfully slowly upset working relationships." (1 principal)
- G "This practice employs a full-time Pharmacist. He has responsibility for verifying and writing repeat prescriptions and he was reluctant to use the computer printouts on FP10 (Comp) without checking the patient's record envelope. So the exercise of printing the 'repeats' by computer did not save the reception staff or the Pharmacist significant time or labour." (3 principals)
- H "Difficulties have also arisen when the patient is given medication in the surgery and in consequence of this the override button is used quite extensively." (1 principal)
- I "We have been studying our repeat prescribing statistics and are slightly disappointed to know that we are unable to get the analysis we require. It is possible to get, as you know, a list of patients on a particular drug. It is not possible to get the total number of patients on repeat prescriptions, nor is it possible to get the number of patients or a list of patients who are receiving repeat prescriptions (ie on the repeat prescribing list) with a particular diagnosis, eg it is possible to know the number with Diabetes Mellitus in your practice, but not the number of diabetics who are receiving repeat prescriptions. It might be possible to list all the patients on Insulin and Oral Hypoglycaemic agents and then add the numbers excluding all those who are on more than one prescription. This may be possible for Diabetes - but is not possible for other conditions such as Hypertension or Angina, as the patient could be on the same drug for either condition. I think this is a very important field on which there is growing interest. We would like to monitor our repeat prescribing with the introduction of certain measures in our practice, but are unable to do this with our present software system." (2 principals).

Patient responses did not usually cause problems, although there were a few exceptions:

- J "The patients generally accepted the computerised repeat prescriptions and our local chemist welcomed it. Except for a few patients, most of them understood the need for our prescription recall system and appreciated the care given to them. However, we did have some queries and disapproval when we started to use the generic drugs." (2 principals)
- K "The patients have by and large accepted the computer. One couple were determined to undermine our repeat prescribing on the grounds that they disliked all computers: the computer won! However, we have found that the institutions, such as the Homes have been the most unwilling to adapt to the new prescribing routine; we felt that they had the most to gain. Individual patients, in contrast, are usually helpful and a large number find the new system easier." (2 principals)
- L "One serious incident occurred when a patient, noting the message 'Until 31/12/84' on the side slip, did not take the action intended to be taken, but instead stopped taking the medication altogether on the aforementioned date." (1 principal)
- Many practices perceived benefits from using the computer for repeat prescriptions:
- M "We have also gradually put on all repeat prescribing for each partner in turn and this has meant a significant saving in the ancillary staff time for this task as well as an increase in accuracy and legibility." (11 principals)
- N "Writing repeat scripts is a big chore in our practice and takes up a fair proportion of the doctors' time because the doctors write and sign all the prescriptions which are also at the same time accompanied by the patients' charts including their red cards so as to allow one to check for any discrepancies. This also takes up secretarial time in lifting and replacing patients' charts. The majority of patients are being issued once monthly repeat prescriptions by the computer, with the objective of all items of medication being renewed at the same time. The advantage to the patients is that he need only make one trip a month to collect the script and he need not have to order the script beforehand." (4 principals).
- O "There are three other important areas in repeat prescribing where the computer is definitely superior. The first is - keeping a tight control over those who are having excessive prescriptions and also in ensuring that patients are at least reviewed annually. It does point to drug interactions, although I feel these are easily ignored. What we have not achieved is checking compliance of those who are not taking their medication regularly." (3 principals)

- P "The computer proved invaluable when the drug Osmosin was withdrawn, and we like to think that without the machine the time taken to contact the patients would have been much longer and possibly impossible." (1 principal).
- Q "We have introduced a restricted prescribing list both to reduce cost and to standardise our treatment to what we consider to be the most effective therapy. We use our repeat prescribing information to monitor how closely we are adhering to this list." (5 principals)

APPENDIX 7

RECALL AND SCREENING

7.1: Doctors' Attitudes

Doctors were asked in the detailed evaluation before the computer was installed how satisfied they were with their manual procedures for screening and recall. Responses are summarised below (DE, D1 Q11):

Table 59: Satisfaction with manual recall methods (% reports from 78 doctors)

Area of recall	% Doctors		
	Dissatisfied	Neutral	Satisfied
Infant immunisations	29.5	7.7	62.8
Rubella vaccination	64.1	11.5	24.4
Cervical cytology	55.0	6.2	38.8
Ante/post natals	11.5	19.3	69.2
Hypertension	53.2	13.9	32.9

They were also asked whether more or less effort should be put into preventive and screening programmes (DE, D1, Q17). The vast majority (92.5%) thought that more effort was needed. A similar proportion (96.2%) anticipated that the computer would help them run a more efficient recall system (DE, D1 Q62).

7.2: Information Categories and Data Entry

Practices in the detailed evaluation were asked 1 year after installation of their computer how much clinical information they had entered for screening or recall. Responses were as follows (DE, PR3 Q31):

Table 60: Amount of clinical information entered on the computer after 1 year (reports from 23 practices)

Information category	Numbers of practices			
	Amount of information			
	None	A little	About half	Most/all
Childhood immunisations	10	5	4	4
Dip-tet booster status	10	8	2	3
Rubella status	11	6	1	5
Contraceptive details	9	8	1	5
Cervical cytology status	7	10	-	6
Ante/post natal details	20	2	-	1
Hypertensive status	12	9	-	2
Diabetic status	13	8	1	1

These practices in the detailed evaluation were also asked at that time to specify the information categories they were using or intending to use for the entry of clinical information. Only 10 (out of 24) were able to do this. The numbers of information categories described by the practices are summarised in Table 61:

Table 61: Numbers of information categories used or planned for clinical data entry (reports from 10 practices)

Numbers of information categories	Numbers of practices
33 (minimum) to 50	2
51 to 75	5
76 to 100	1
101 to 130 (maximum)	2

Very little progress had been made in these practices in the summarisation of notes. Most data had been entered from existing manual registers or summaries (eg patient summaries, cervical cytology recall systems), or as part of the routine procedures for claiming item of service payments or filing test results.

7.3: Use of the Recall Facilities

Practices were asked after one year if they had used the computer for screening or recall. Responses are summarised in Table 62 (LE, C):

Table 62: Use of computer recall facilities 1 year after computerisation (% reports from 108 practices)

Area of recall	% practices making use
Rubella	52.7
Pre-school booster	27.2
Any (total)	74.1

Further information about practices' use of the computer for screening or recall derives from the December 1984 progress interviews. They were asked if they were identifying or calling groups of patients with the computer. Responses were as follows:

Table 63: Use of computer recall facilities in December 1984 (% reports from 137 practices)

Area of recall	% Practices making use		
	None	Patients identified only	Patients recalled
Childhood immunisations	83	8	9
Rubella	61	7	32
Cervical cytology	53	11	36
Hypertension	89	5	6
Specific drugs	69	8	23
Any (total)	23	21	56

The computer did not wholly displace previous manual systems however as the following figures from the detailed evaluation indicate (DE, PR1 Q41, PR3 Q35):

Table 54: Methods of recall used before 1 year and after computerisation (reports from 23 practices)

Area of recall	Time period	Numbers of practices using various recall methods			
		None/ passive	By DHA/HB	By practice	
				Manual	Computer
Infant immunisation:	Before	2	18	3	-
	After	2	18	2	1
Rubella vaccination:	Before	10	8	5	-
	After	3	9	2	9
Cervical cytology:	Before	9	5	10	-
	After	6	2	8	7

7.4: Take Up of Screening

Practices were asked to specify the numbers of children aged 5 years in the practice and the numbers of those who had received their diphtheria-tetanus booster. They were asked for similar figures for the numbers of girls aged 11 years and the numbers who had been given a rubella vaccination. From these figures it was possible to calculate the rate of take up for these two preventive procedures before the installation of the computer and one year afterwards. Unfortunately the available data was very incomplete. No significant change was however recorded in the data to hand as Table 65 indicates (LE, RCI):

Table 65: Immunisation rates before and 1 year after computerisation (averages per practice, numbers of practices in brackets)

Rates	(n)	Average rate per practice (%)		Probability of before/after difference
		Before	After	
Dip-tet booster:				
By practice	(29)	61	67	0.359
By other	(14)	13	13	0.648
Rubella vaccination:				
By practice	(26)	45	53	0.248
By other	(15)	13	15	0.332

7.5: Practice Reports

Entry of clinical information was a major task for many practices:

- A "Data input was rapid for the registration and repeat prescription data; the delays are in loading clinical and screening information; this needs processing by me [the doctor] and pressures on my time are the source of the delay ... I feel that once our enormous amount of clinical data is loaded, the potential for preventive and epidemiological work might be there, but I feel overwhelmed by the size of the task in progress." (1 principal)
- B "Summarizing all the notes and putting in indicators has proved a mammoth task and we still have some way to go before it is complete. Effectively, the notes are being sorted and culled at the same time as being summarized. This is a time-consuming, salutary but sometimes amusing process!" (3 principals)
- C "We finally turned to the Indicator Section where we still have problems. Our first effort was based on the International Classification and was drawn up by myself: my partner and trainee both rejected it on the ground that they could not interpret my codes. I found it very difficult to produce a comprehensive and comprehensible system of four letter codes. We have for the moment settled for a much simpler list ... and we now have approximately 30% fully loaded." (2 principals)
- D "Subsequent loading of clinical data has been very limited. All immunisations (including rubella) and cervical smears were loaded on first pass, but a disease index has been held back awaiting the RCGP classification or a cluster group consensus." (1 principal)

Some practices experienced weaknesses in the software:

- E "Conditional searches of the type 'IF X AND Y BUT NOT Z' would be useful but are not possible anywhere in the system. This is a major limitation." (8 principals)
- F "The Computerised Disease Index is not necessarily an improvement on the manual system. Again because of the slowness of searches. The indexed indicator package would improve on this situation but we have been told that it would be inadvisable to try and index all the indicators that we were using and that incidentally we were previously using with our manual system, ie about 700." (4 principals)
- G "One major problem has been the inability to use the [recall] module to any reasonable degree of success." (4 principals)

Progress had, however, been made in some practices:

- H "Most of our recent work has been on the use of the [recall] section particularly with a view to morbidity recordings. We have adapted the new RCGP coding (occasional paper 26) for morbidity recording within the practice although we do not intend to run an E book. Patients are now having their notes summarised to include significant conditions. Also included are vaccination details, last cervical smear result, smoking and drinking habits, weight and social class. We hope ... the summaries should be completed and entered during the next year. Mechanisms for continual updating have been planned." (3 principals)
- I "When looked at from the point of view of the patient in the community the computer's impact is going to be on individual preventative medicine. Community preventative medicine has been in existence for well over 100 years. We can now move into the area, as mooted in our cluster discussion, of individual preventative medicine. I am endeavouring to record the blood pressure of all adults in their middle years on my [summaries] and we could move forward perhaps and construct a health profile for each individual to include height, ideal weight, exercise taken, smoking and drinking habits, diet, occupational hazards and many other things. For several months now we have been doing monthly recalls." (3 principals)
- J "A protocol has been evolved in order to achieve regular and adequate follow-up of diabetic patients. Vaccination history is being recorded and it is hoped to embark shortly on an active measles programme." (4 principals)
- K "We have used our computer both as a word processor and as a source of information in recalls, particularly for Tetanus immunisation, Rubella immunisation, Cervical cytology and in follow-ups to certain of these categories. We have used it to call up lists of patients who are on various drugs, sometimes to check on drug interactions. Lastly we are setting up an arrangement to use it to check our Populations Screening programme for Hypertension." (3 principals)
- L "No doubt work load increases as a result of recall procedures because of extra phone calls into the practice by patients, thus producing extra pressure on staff. It is therefore important in my mind to introduce each new procedure slowly and not all together, thus giving everybody time to adapt." (4 principals)

INNOVATIONS8.1: Innovations

Innovations were not directly assessed in the evaluation, but practices were asked to report on new procedures arising after the introduction of the computer. Innovations may be regarded as new procedures of particular significance. No objective assessment of the significance of new procedures reported was possible. The examples given in the text are therefore selectively drawn from practice reports of new procedures.

Practices were asked about new procedures arising subsequent to the delivery of the computer in two ways. First, they were requested to return light evaluation logs of such changes on a recurrent basis. Second, during the December 1984 Progress Interviews they were asked directly if any new procedures had been adopted.

8.2: The December 1984 Progress Interviews

Of 137 practices responding, 7 recorded no new procedures. The 264 responses from the remaining 130 practices are summarised in Table 66. They have been categorised into the four main areas of computer application (Registration, Repeat Prescribing, Recall and Patient Records) plus an 'Other' category. Within each of these categories an assessment has been made of the type of change that has occurred. It should be stressed that these procedures are new for the particular practice in question and thus whereas one practice may have instituted a rubella recall programme another will have modified the means of carrying out an existing recall programme. These are thus categorised as a new recall programme, and a new recall procedure respectively.

Table 66: New procedures reported in five areas of application by 137 practices in December 1984

New procedure	No of instances
1 Repeat Prescribing:	
Change in notice required for collection:	
increase	17
decrease	6
not specified	5
	cont'd ..

Table 66 continued ...

Improved review and control	16
General changes in procedure	12
Repeat prescriptions done on the computer	9
New or more use of repeat cards/updating forms	8
Prepared prior to request	6
More systematic order, production, collection procedures	5
Generic prescribing, new practice formulary	4
Less use of notes/repeat cards	3
	--
2 Recall/Screening	91
New programme of recall/screening for:	
cervical cytology	11
rubella	6
hypertension	4
dip tet/polio	4
other	10
New recall/screening procedure	20
Lists produced for health visitor	12
New clinic started	8
Use of manual systems	2
	--
3 Registration	75
Registration on computer:	
general	4
new patients	2
family planning, temporary residents	2
More efficient procedure	7
Checking registration records	5
Identification of branch surgeries/practices	3
Patients use registration number when presenting	1
	--
4 Patient records	24
Use of patient summary (sheet) for surgery or home visit	11
Patients providing information via questionnaire	8
Use of encounter update form	6
Summarised patient record	5
Recording diagnosis/morbidity	4
Labelling or tagging of notes	4
Recording attendance/non-attendance	2
Health visitors providing information	2
	--
5 Other	42
Practice meetings	7
Staff reorganisation	7
Information produced for patients	6
Various lists produced (eg rotas, home visits)	4
General audit	2
Miscellaneous	4
	--
	33

8.3: The New Procedure Logs

Information from the recurrent logs was not obtained from all the practices. However, the responses received also identified whether or not the new procedure was due to the computer. Of the 88 practices returning forms, 11 (13%) identified no new procedures. The responses from the others are summarised in Table 67 (LE, NP1):

Table 67: New procedures after computerisation (numbers and % reported as due and not due to the computer by 77 practices)

Cause of new procedure	Numbers	%
Due to computer	370	72.7
Not due to computer	111	21.8
Irrelevant or not specified	28	5.5
Total	509	100

These were then categorised into areas of application. Numbers of practices and numbers of responses expressed as percentages of the totals are summarised in Table 68:

Table 68: Areas of application of new procedures due and not due to the computer (% reports from 77 practices making 509 responses)

Area	Due to computer		Not due to computer	
	-----		-----	
	% Practices	% Responses	% Practices	% Responses
Recall/screening	65	22	23	6
Repeat prescribing	68	16	13	3
Patient records	47	12	12	2
Registration	25	5	5	1
Audit	18	4	4	1
Personnel changes/ reorganisation	17	4	13	4
Other	17	9	16	5

Most new procedures were reported to be due to the computer, although in terms of personnel changes and reorganisation, other factors appeared to be just as common.

8.4: Practice Reports

The computer encouraged the practices to systematically collect and maintain information:

- A "We have moved over to an individual list system and the computer has faced us with the reality here and forced us to allocate patients; to complete the process the notes have been colour tagged at the same time as setting the computer file and allocating numbers. The computer enables us to monitor partners' lists and tells us where to allocate (uncommitted) new patients." (3 principals)
- B "All of our patients are entered in Patient Registration and we are continually attempting to gain additional information by asking patients to fill in a questionnaire supplying details of telephone number, occupation and numbers and names of people within the household. In this way households are grouped together and given a family number as are institutions such as Residential Homes." (3 principals)
- C "We keep a [summary sheet] of all patients who die, with cause of death if possible (our "Dead Globs" file!) - this may prove interesting over a period of time. Copies of the [summaries] have been used as enclosures to referral letters and, in emergencies, the referral letter has occasionally been written at the bottom of the [summary] sheet itself." (3 principals)
- Some practices introduced more generic prescribing and improved their monitoring of drug information:
- D "We decided to agree a prescribing list between the partners which has been introduced to the machine and our repeat prescribing is now almost completely generic." (5 principals)
- E "We have introduced a large measure of generic prescribing in the drug dictionary: we do not yet know how this will affect our prescribing costs. By weeding genuine repeats from casuals we can now operate prescribing policies with much greater effect. We also see how varied is compliance, giving us a much greater insight into our patients and their habits." (2 principals)
- F "Other functions we are carrying out at the present time on the computer are searches for particular drugs for review purposes via our repeat prescription module and analysis of the prescribing habits of the doctor." (7 principals)

The computer has also been used to help run recall and screening programmes and to analyse registration and clinical information:

G "Our cervical screening programme is much more thorough and we provide our patients with a more rapid and complete results service. We have picked up a number of FP1001's which had been neglected by default. We have introduced a practice information sheet which I feel is valuable and is easily adapted to changes and our practice questionnaire saves surgery time and allows quicker loading of indicators." (2 principals)

H "Screening: (A) Cytology. A card index system was transferred to the computer ... A recall letter is set up in the word processor and monthly searches are carried out. In addition a 'call' system has just been commenced, starting with those ladies who are 35 years old this year. (B) Rubella. A protocol was developed by a trainee as his project. Patients were selected by age, and a letter set up in the word processor unit. Of the patients selected, 210 had immunity established from the manual records, 173 were called for blood tests of which 48 were proved immune, 4 susceptible.

Other clinical programmes: (A) Flu vaccinations are being recorded as given so that a list is readily available next year. (B) A protocol has been evolved in order to achieve regular and adequate follow-up of diabetic patients. (C) Vaccination history is being recorded and it is hoped shortly to embark on an active measles programme." (4 principals)

I "We have analysed all those patients on repeat prescriptions and linked this to Morbidity so that we know how many patients are on Long Term Treatment for what condition. We have also been auditing our care of patients with Angina Pectoris and Diabetes Mellitus, with a view to setting up a Diabetic Clinic in our practice. We have also of course been able to get lists of elderly for review at practice meetings." (5 principals)

J "Since the completion of the indicators a large number of searches have been carried out which are being built up into a practice profile: examples include the fact that over 25% of the practice list have been registered less than five years, the geographical distribution of patients or that 550 women aged 18/60 had not had a cervical smear in the last five years. A disease register of the 50 specific diseases is also being built up, and partly used to reconstruct the list of those who should be offered influenza vaccination next autumn. A preliminary audit was also carried out of those diagnosed as hypertensive, looking at the degree of control and date of last review. We trust this will be the first of many.

By associating the search and word-processing facility we have now organised a recall system for children to have seven-month and two-year checks, the computer printing out the appropriate appointment letters. A similar system is being used to call patients aged 35, 40 or 45 who have not had a cervical smear within 5 years and this will be extended now the practice has a new partner. Letters are also sent by the computer to patients who need treatment or early recall following a smear." (3 principals)

K "An audit program was run in 1984 ... Our results show that 1,411 people made 8,963 appointments in 1984, thus making well over 50% of the practice active. A figure which would not have been contemplated if asked for assessment before checking with the computer." (1 principal)

- L "We have printed (A) a total practice list to update it by comparison with our clinical records; (i) registration status of patients with no notes; (ii) registration status of patients with notes and not on list; (iii) new addresses; (iv) deceased and left patients; (B) a list of over 65's for our district nurses to use as a checklist for patients who are or may be needing visiting (care) nursing etc; (C) a list of under 5's for our Health Visitors to obtain NHS numbers and for a checklist re vaccination defaulting; (D) a list of 30 to 65 year old patients to include a hypertension screening project." (3 principals)

Various uses have also been found for the word processing facilities:

- M "Word processing is used to keep various standard letters on file. Examples are: (i) Practice details to send to prospective trainees; (ii) invitations for rubella vaccination when patients are found to be susceptible; (iii) letters to be handed to patients if consultations are being video-taped or recorded as part of training; (iv) instruction sheets." (3 principals)
- N "I have started putting instruction sheets on the word-processor file, i.e. exercises for frozen shoulder, or advice about fibre diets; only a few leaflets need then to be stored as hard copy." (3 principals)

APPENDIX 9

ATTITUDES

9.1: Attitudes Before Delivery

All doctors and staff were asked before delivery to indicate their feelings about getting the computer. Responses from doctors and administrative staff are summarised in Table 69 (LE, ATT1):

Table 69: Feelings about the computer before its arrival (% reports from doctors and staff, numbers of respondents in brackets)

Feeling	% Doctors				% Staff			
	(n)	Not really	Fairly	Very	(n)	Not really	Fairly	Very
Interested*	(487)	3	32	65	(734)	3	37	59
Open minded	(443)	7	48	45	(612)	3	50	47
Excited*	(447)	28	51	21	(506)	44	42	14
Unprepared*	(418)	41	39	20	(456)	33	33	34
Confident	(437)	34	57	9	(486)	32	61	7
Apprehensive*	(441)	61	34	6	(571)	48	41	11
Anxious	(439)	62	33	5	(480)	67	26	8
Bored	(406)	95	4	1	(391)	95	3	2
* Significant differences between doctors and staff								

Doctors reported themselves significantly more interested and excited and less unprepared and apprehensive than staff, although on other items there was little difference.

In the detailed evaluation doctors and staff were also asked how they felt about the practice getting a computer. Responses are summarised in Table 70 (DE, D1 Q61, S1 064):

Table 70: Feelings about the practice getting a computer (% reports from 80 doctors and 155 staff)

Feeling	Rating	% Doctors	% Staff
Very positive	(1)	46.2	15.5
Fairly positive	(2)	35.2	23.2
Neutral	(3)	10.0	51.0
Rather negative	(4)	8.8	8.4
Very negative	(5)	2.5	1.9
Mean ratings		1.9*	2.6*
* Doctors significantly more positive: $p < 0.001$			

These doctors and staff were asked about their satisfaction with their manual procedures for registration, repeat prescribing and recall. Responses are summarised in Table 71 (DE, D1 Q8 Q11 Q40, S1 Q11 Q43):

Table 71: Satisfaction with pre-computer manual procedures (% reports from 80 doctors and 136 staff)

Procedure	Extent of satisfaction	% Doctors	% Staff
Registration:	Dissatisfied	26	5
	Uncertain	18	8
	Satisfied	56	86
Repeat prescribing:	Dissatisfied	41	10
	Uncertain	8	4
	Satisfied	51	86
Rubella recall:	Dissatisfied	64	-
	Uncertain	11	-
	Satisfied	25	-
Cytology recall:	Dissatisfied	55	-
	Uncertain	6	-
	Satisfied	39	-

They were also asked about whether they thought more or less effort was needed in these areas. Responses were as follows (DE, D1 Q10 Q17, S1 Q15 Q43):

Table 72: Comparative amount of attention/effort needed for various procedures (% reports from 80 doctors and 143 staff)

Procedure	Comparative effort needed	% Doctors	% Staff
Registration:	More than before	69	40
	Same as before	27	60
	Less than before	4	0
Repeat prescribing:	More than before	59	29
	Same as before	38	70
	Less than before	3	1
Recall/screening:	More than before	92	52
	Same as before	8	47
	Less than before	0	1

9.2: Expectations and Experience of Benefits

Doctors in the detailed evaluation were asked about their expectations of benefits before the computer was delivered and 3 months after delivery. They were also asked about their experiences one year later. Responses are summarised in Table 73 (DE, D1 Q62, D2 Q43, D3 Q72):

Table 73: Benefits expected by 80 doctors before delivery and 63 doctors 3 months afterwards, and experienced by 67 doctors after 1 year (% reports)

Area of benefit	% Doctors								
	Expected before delivery			Expected after 3 months			Experienced after 1 year		
	Yes	?	No	Yes	?	No	Yes	?	No
More efficient recall	96	3	1	96	4	0	68	7	25
Monitoring of prescribing	92	4	4	88	4	8	80	6	14
More accurate registration	89	9	4	91	3	6	77	13	10
Improved planning	76	18	6	62	15	23	55	25	20
Better patient records	71	15	14	65	21	14	41	21	38
Chronic disease management	70	18	12	49	33	17	29	25	46
Clinical review	65	19	16	60	27	13	40	15	45
Research	52	29	19	59	18	23	30	10	60
Clinical prompts	44	25	31	49	28	22	30	25	45
Savings in staff time	47	19	34	44	19	37	20	9	71
Increased income	20	15	65	10	20	70	3	14	83
Decreased running costs	10	19	71	0	29	71	0	14	86

Doctors' expectations of benefits were largely maintained after three months, and benefits experienced after one year arose in the expected areas,

particularly registration and repeat prescribing. Other anticipated improvements (e.g. recall, patient records, chronic disease management) were however taking longer to appear.

Staff were asked three months and one year after delivery if the computer had brought any benefits to the practice, or produced anything useful. Responses are summarised in Table 74 (DE, S2 Q43, S3 Q73):

Table 74: Staff views on whether computer had produced anything useful (% reports from 130 staff after 3 months and 119 staff after 1 year)

	% Staff			
	After 3 months		After 1 year	
	No	Yes	No	Yes
Anything useful?	71	29	29	71

The most commonly cited benefits after one year were in general efficiency (38%) and repeat prescriptions (29%).

9.3: Expectations and Experience of Problems

Doctors were asked to report on problems anticipated before delivery and experienced (after 3 months and after 12 months). Responses are summarised in Table 75 (DE, D1 Q63, D2 Q46, D3 Q74):

Table 75: Problems expected by 80 doctors before delivery, and experienced by 67 doctors 3 months and 1 year afterwards)

Type of problem	% Doctors								
	Expected before delivery			Experienced after 3 months			Experienced after 1 year		
	Yes	?	No	Yes	?	No	Yes	?	No
Manual to computer transition	96	1	3	46	14	40	66	8	26
Change in working methods	90	2	7	49	6	45	64	5	33
Links between manual and computer system	87	9	4	40	43	17	47	14	39
Staff reactions	83	7	10	67	9	24	72	3	25
Software	77	19	4	49	20	31	63	16	21
Hardware	64	22	14	38	17	45	60	16	24
Capital cost	65	10	25	40	12	48	46	21	33
Running cost	62	14	24	16	21	60	30	30	39
Unauthorised access	22	21	57	2	7	91	2	9	89

Doctors anticipated various problems before delivery both with the cost and reliability of the computer system itself and in terms of the necessary organisational changes. They did not however generally anticipate confidentiality problems. Substantial numbers of doctors reported problems to have arisen after 3 months and more after one year. However these were experienced by fewer doctors than had anticipated them, particularly in the financial field. However, the majority noted problems had occurred in terms of staff reactions, transitional difficulties and problems with software and hardware. Ancillary staff were also asked about problems caused by the computer 3 months and 12 months after delivery. Responses are summarised in Table 76 (DE, S2 Q45 Q46, S3 Q74):

Table 76: Problems caused by computer (% reports from 133 staff after 3 months and 89 staff after 1 year)

	% Staff reporting problems	
	After 3 months	After 1 year
Any problems caused by computer?	45	71
Examples cited included:		
Time/work required	24	17
Confusion/upheaval	12	8
Relationships/feelings	24	27

Both doctors and staff were asked how relationships had been affected by the introduction of the computer 3 months and 12 months after delivery. Responses are summarised in Table 77 (DE, D2 Q55 Q56, D3 Q51 Q52, S2 Q55 Q56, S3 Q53 Q54):

Table 77: Impact of computer on practice relationships 3 months and 1 year after delivery (% reports from 68 doctors and 118 staff)

	% Doctors			% Staff		
	Better	Same	Worse	Better	Same	Worse
After 3 months, how are relationships between ...						
Doctors?	4	88	8	-	-	-
Doctors and staff?	6	72	22	1	63	36
Staff?	-	-	-	2	65	33
After 12 months, how are relationships between ...						
Doctors?	4	80	16	-	-	-
Doctors and staff?	6	62	32	2	78	20
Staff?	-	-	-	5	63	32

9.4: General Attitudes to Computers

Doctors and staff in all the practices were asked to indicate their agreement or disagreement with 12 statements about the use of computers in General Practice. The statements were balanced between items whose endorsement was positive towards computers eg "A computer simplifies office procedures" and those which were negative eg "Computer systems reduce job satisfaction in an office".

Responses were added together and converted to a 10 point scale on which scores below 5 represented negative attitudes towards computers and those above 5 positive attitudes. Scores near 5 could be achieved either by large numbers of undecided responses or by equal numbers of positive and negative responses. These scores were then analysed to see if there were any differences between doctors and staff or according to when the questionnaire had been completed: before the computer was installed, after training (by those trained) and a year after installation. Because the analysis compared individuals' views across the time periods, it could only include people whose responses were available for all the times under consideration. Results are tabulated in Table 78 (LE, ATT2):

Table 78: General attitudes to computers before delivery, after training, and after 1 year (average scores from 162 doctors and 194 staff)

Time period	Average scores*	
	Doctors	Staff
Before installation	5.94	5.60
After training	5.75	5.55
After one year	5.95	5.55
* Differences between doctors and staff statistically significant ($p = 0.01$), but not those between time periods ($p = 0.22$).		

Examination of the table suggests differences by job with doctors significantly more favourable than ancillary staff. Differences on scale scores by time period are not statistically significant, but both doctors and staff were less likely to be undecided after 12 months than they had been before the arrival of the computer, as is indicated by the examples in Table 79 (LE, ATT2):

Table 79: Undecided responses about effects of computer before its arrival and 1 year afterwards (% reports from 315 doctors and 459 staff)

Statement about computers about which respondents were undecided	% Doctor		% Staff	
	Before	After	Before	After
A computer simplifies office procedures	23.9	16.8	29.8	16.3
Breakdowns in a computer system are rare and easily remedied	50.2	21.9	49.7	20.0
Computer systems reduce job satisfaction in an office	22.2	18.7	29.0	21.6

However respondents' views were fairly consistent over time, those with initially favourable attitudes tending to retain them, as Table 80 suggests. It displays the correlation between individuals views at the different time periods, all of which are very highly statistically significant.

Table 80: Correlation between general attitudes towards computers at various time periods (numbers of respondents in brackets)

Time periods considered	(n)	Correlation coefficient
Before and after training	(509)	0.48
After training and after 1 year	(424)	0.56
Before and after 1 year	(827)	0.45

Another general question doctors and staff were asked about computers concerned their potential usefulness to General Practice. Responses before installation and after one year are summarised in Table 81 (LE, ATT1, ATT3):

Table 81: Usefulness of computers to General Practice (% reports by 503 doctors and 790 staff before computerisation and 389 doctors and 605 staff 1 year afterwards)

Usefulness	Rating	% Doctors		% Staff	
		Before	After	Before	After
Essential	(1)	16	12	10	11
Very useful	(2)	48	45	52	46
Fairly useful	(3)	26	27	27	28
Of limited use	(4)	9	15	11	14
Of no use at all	(5)	1	0	0	1
Mean ratings		2.3	2.6	2.3	2.5

Although there were no differences between doctors and staff on this measure, and both continued to think computers would be useful, there was a small but statistically significant ($p < 0.001$) trend towards more negative views after one year of use.

9.5 Overall Assessments

In the light evaluation doctors and staff were asked whether they wished to continue to use the computer or not a year after delivery. Responses are summarised in Table 82 (LE, ATT3):

Table 82: Preferences about future use of computer after 1 year (% reports from 386 doctors and 595 staff)

Preference	% Doctors	% Staff
Continue its use	37	52
Expand its use	60	37
Throw it out	4	10

Doctors were significantly more favourable than staff ($p < 0.001$), but both groups were generally positive.

In the detailed evaluation doctors and staff were asked whether, all in all, they thought the computer had been worth getting. Responses are summarised in Table 83 (DE, D3 Q78, S3 Q79):

Table 83: Assessment after 1 year of whether computer was worth getting (% reports from 69 doctors and 127 staff)

Assessment	% Doctors	% Staff
Definitely not	12	5
Probably not	9	7
Not sure	10	19
Probably so	45	39
Definitely so	25	30

9.6: Practice Reports

Attitudes prior to computerisation varied:

- A "The youngest partner in the practice was enthusiastic to apply. The other partners agreed, the practice was shortlisted and a demonstration was attended by the youngest partner and the middle (senior) partner at which a preference for one of the systems was agreed. The senior

partner who had had considerable doubts became rather more enthusiastic after the demonstration. The Practice Secretary while also a bit doubtful was basically keen and agreed to administrate." (3 principals)

B "The computer arrived just over a year ago amidst a certain amount of excitement - akin to that experienced by a child with a new toy! Of the doctors, some saw it as a great step forward a useful, valuable and flexible office and research tool. Some doctors regarded it purely as an extra piece of office equipment and some regarded it with distinct doubt and really only agreed to it to keep the rest of us quiet! (3 principals)

C "Overall I get the impression from most of the staff that they are somewhat sceptical about the point of having the computer, as they feel they run a fairly efficient manual system (with which we agree). However I think they haven't understood the potential benefits to us in the role of preventative medicine follow ups etc as it hasn't yet been used, so we are hoping to persuade them that it will be a GOOD THING in a few weeks' time." (4 principals)

Although staff usually coped well with the computer, various problems arose as the computers were used:

D "The installation proceeded without too many hitches, and our first instruction days went well. The system seemed easy to use and our office staff, who had been on a basic computer course at the local tech. college, seemed to take to it like ducks to water." (3 principals)

E "The reaction of the other two practices in the Health Centre has largely been hostile. A move to relocate the printer in the office was greeted by the reaction "Over my dead body" by one doctor. I feel that this attitude stems largely from ignorance of what the computer is supposed to do, and so far we have been unable to demonstrate any large-scale benefits.

Our receptionists have taken fairly well to the computer, apart from one casualty who left us six months ago. They have taken a much stronger role in repeat prescribing than they did before and have succeeded in surmounting the problems and changes with a fortitude that I had not expected." (2 principals)

F "Staff relationships remain amicable so long as the computer is not mentioned. Their particular irritations focus around response times." (1 principal)

G "The relationships between the staff who used the computer and those who didn't were initially rather fraught; however, with time these have settled down and most of the staff now seem to accept the computer and some enjoy using it although most are not sure if it is a benefit or not." (4 principals)

H "The machine has obviously had much greater impact on the office staff who actually use the machine. The initial enthusiasm was tempered a bit

by the realisation of how much work was actually involved in transferring information from already existing and adequate manual registers onto the computer. Suitable bribes have ensured that the bulk of this has now been carried out, although there may be an undercurrent of feeling that however much work they do we will always think of something new to keep them busy, and in that sense the computer may be a bit of a millstone. They may well be right." (3 principals)

I "The computer was last switched on in September [1984] at which time all enthusiasm had more or less faded. Both the secretary and the younger partner were, to their surprise, prepared to give the whole thing up. At this stage the middle (senior) partner suddenly felt that this was not enough and organised a meeting of all the doctors and the secretary to review the situation. This was the first really honest meeting between us all on this subject and it touched on basic attitudes to the practice as well as attitudes to the computer and the practicalities of using it." (3 principals)

J "Uncertainty of the function of the machine has no doubt resulted in tensions within the practice and not just with the staff but with the doctors also. Generally however we have not yet fallen out in the practice regarding this and the staff seem to cope very well with problems generated." (4 principals)

After a year's experience, most practices felt they had gained benefits, although they were also aware of the work that had been needed:

K "In conclusion, we are now beginning to see daylight after a long period of doubt as to whether the computer would be useful. This was particularly so because we had a number of hardware breakdowns, but the general feeling in the practice is that the machine is beginning to make itself useful and most of the staff and doctors consider it to be a worthwhile venture." (6 principals)

L "Doctors' attitudes: A bit of frustration when it won't put our good ideas into practice from the pro-computer lobby. A not very grudging acknowledgement that computers can be a good thing from the anti-computer lobby - except that the machine keeps asking patients to come and see him for their next repeat prescription!" (3 principals)

M "Perhaps the most important point here is how the scheme has raised the general consciousness about the benefits of computerisation and taken away the fear ... General practice is something all my partners have come into on positive grounds ie on the basis of a desire to do general practice ... Nevertheless after a few years experience everyone goes through the stage of finding at least part of the work humdrum and tedious, and we all feel that the ability to pick an interesting subject out and study it in depth is a major advantage of our system ... We hope that the very considerable extra work involved in providing this morbidity data will be used with this end in mind." (4 principals)

N "The practice's general opinion is that it has been a very costly exercise without much benefit to us." (4 principals)

- O "All in all, I think we have had a good deal from the Government. Filling in various evaluation forms seems a very reasonable price to pay for a cut price introduction to General Practice computing. The computer has proved useful so far and we are only just starting - it is going to be yet more useful. There is a lot of room for improvement in software, and it is important not to under estimate the amount of work involved in getting the things going. I am glad we did not have to pay the full whack!" (3 principals)
- P "It was widely felt that the computer had not yet become an asset to the staff, it has caused many headaches; i.e. breakdowns, extra filing, a great amount of updating and generally extra work for everyone. The prescribing module seems to be working well and the patients seem very pleased with their 'posh' prescriptions. However, we all feel that it is going to be sometime before the computer is one of the office staff; at the moment it seems to be a bit of a passenger!" (4 principals)
- Q "My partner and I, however, feel that the introduction of a computer in our practice, although increasing the workload, has made the system more methodical, systematic, efficient and interesting." (2 principals)
- R "When the computer is looked at from the Doctors' point of view in our practice I regard it as an expensive catalyst. It has facilitated changes in the practice which, given drive and determination, could quite easily have been achieved without its presence and at less cost. The computer has provided two things for the secretaries, taking over the chore of writing repeat prescriptions and secondly providing employment for another half-time secretary." (3 principals)
- S "The computer has proved an exciting and challenging addition to the practice. It has certainly not saved us any work, although the staff have been helped. We have worked harder, but it has been more interesting. Hopefully patient care will also benefit." (3 principals)
- T "The first year of the computer's presence has been highly successful; we now have an effective system which has already improved the efficiency of the practice, enabled us to start more preventive work and to initiate some audit. Doctors and staff have adapted well to the new procedures, and although we have entered information from 3500 patient contacts in the last three months as well as dealing with registration and medication, the information is now up to date. Despite one or two major hitches, we have never failed to have good support from [the supplier] and are grateful for their help." (3 principals)
- U "Our experiences with our machine are mixed, with most of the satisfaction coming from my side, and most of the irritations being discovered by the ancillary staff." (1 principal)

FACTORS AFFECTING SUCCESS

Factors identified by the practices as affecting progress fell into three main categories. First, there were those internal to the practice such as preparation, commitment, organisation and resourcing:

- A "Because we had already a problem list prepared on our patients, within a year we had basic information, a complete morbidity index, those patients on regular repeat prescriptions and cervical cytology on the computer." (5 principals)
- B "It is worth saying perhaps that prior to the arrival of our computer we felt that we were reasonably well organised with A4 problem oriented medical records and various registers and recall systems already in existence ie Age/Sex, Disease, Geographical indexes; Cervical cytology recall, Rubella screening. Our notes were arranged numerically using a four figure number and access was by means of a master card index ... We were able to load all the registration details from our master card index in two months, ie over 9000 patients. We were then able to load information directly from our pre-existing indexes, ie Cervical Cytology Recall, Rubella and our disease index." (4 principals)
- C "We have been slow in incorporating the computer into our daily routine. This has been due to a number of factors some of which relate to the functioning of the system - we had not appreciated what a time-consuming business compiling [summaries] would be - and some relate to problems within the practice itself - we had a change of partners at the end of last year which inevitably affected the amount of time devoted to reorganisation related to the computer." (3 principals)
- D "I feel that our first error arose from accepting a system that we did not fully understand. Because we were inadequately prepared, we have not been able to take full advantage of the benefits. A less well motivated practice could easily have been put off at an early stage. Learning by trial and error on a completely new system is best left to hardened enthusiasts and computer buffs. Developing new uses of a standard system is a much more practical step for the majority of practices.

Our second, and by far the biggest, error was in siting the computer. The system is located in the Common Room, commonly otherwise unused, at some distance from the office. At the pre-installation meeting this was agreed as the easiest and perhaps least obtrusive alternative for the other practices: whilst loading patient registrations it seemed a positive point. However, all input must be done by a receptionist who must be absent from her normal duties, leaving her partner to cope with all the routine work. It is, I feel, essential to regard the computer as an indispensable office tool, sited in the office and not in a side room out of the way.

Our third error is attitudinal and has largely arisen because of the above. Being sited out of the line of sight, the doctors, busy as we always are, have tended to neglect its applications as a clinical tool and have regarded it as a means of reducing the time spent writing repeat prescriptions. We hope to overcome this by two means - resiting the computer and encouraging ourselves to take a more positive attitude to the machine and its uses." (2 principals)

E "We found the siting of our computer in the reception area was a disadvantage during the registration period. The hubbub and level of interruption seriously impaired the Secretary's concentration on the task in hand. However, this siting is now a definite advantage because it enables the reception staff to work on the computer without leaving their post." (3 principals)

F "In the proceeding year 80% of patients had been changed to problem oriented records and the practice had already a card index system for repeat prescriptions, and an age/sex register ... We are just now beginning to see the benefits in terms of practice organisation. There is a need for a minimum of 20 hours work per week on the computer on an ongoing basis and an additional member of reception staff is now being recruited.

Lessons learned: Inadequacy of level 1 system; Larger workload than anticipated in entering data; Higher workload than originally envisaged in day to day keeping up to date." (3 principals)

G "Prior to the arrival of the machine a register had been prepared and kept 100% up to date of all the items of data that would be required for the registration module of the level 1 system. Being a single-handed Practice in a multi-user office careful thought was given to its location and also to the involvement in initial data loading." (1 principal)

H "None of us had anticipated the size of the workload created by the acquisition of a computer; but only by feeding it with accurate, complete and regularly updated information can its full potential be realised. Already we have used it to call up patients for cervical smear tests, rubella immunisations and special sessions for diabetes and asthma, but these exercises hardly demonstrate the capabilities of computerised medical records. There needs to be a high level of enthusiasm for the computer in all the users of the system if it is to be fully developed. After the novelty has worn off, enthusiasm has to be maintained by practical demonstrations of the benefits that the computer can bring by saving time and improving access to information. This is our aim as we start our second year of use with our [system]." (3 principals)

I "Our venture into introducing a computer into the practice has very nearly failed and the long term outcome is still quite unclear. Contributory factors include: (1) Enthusiasm on the part of the youngest partner which was not matched by detachment, planning or management

skills necessary for successful day to day running. (2) Inadequate communication between the doctors throughout so that doubts, anxiety, practical problems and attitudes were never properly discussed until over one year after the computer was installed. (3) Grossly inadequate space and probably insufficient numbers of staff. These two are inter-related. We were unable to take on more staff as there is no room. If the computer were in a separate room it would have been possible for the existing staff to have spent time on it much more effectively. (4) We had no real or practical concept of the number of skilled person hours needed to put the notes and correspondence in satisfactory order nor did we initially really accept that this was a pre-requisite for satisfactory (clinical) data loading onto the computer. This problem has still not been adequately faced or dealt with. (5) More experience on the part of [the supplier's] staff may have helped us foresee and perhaps avoid some of these problems." (3 principals)

Second, there were factors concerned with the computer's usability and reliability:

- J "Following on from a large number of faults with the software and the hardware of our computer, recent use as with day to day practice management has deteriorated ... I am finding a number of difficulties ... with regard to search facilities and this has seriously hampered my use of the computer." (2 principals)
- K "Throughout this period the hardware behaved perfectly. With the exception of a blown VDU, exchanged by [the supplier] within 48 hours, the machine worked long hours, often into the early morning and any software fault was dealt with by the company usually over the telephone the same day." (1 principal)
- L "Unfortunately all our other registration details and recall set up have taken a back seat because of the numerous faults that we have had with both software and hardware. At least one member of staff remains optimistic, all other ancillary help and senior partner are on the point of scrapping the whole damn machine." (2 principals)
- M The next drawback though was found to be the printer. The level of noise caused problems with telephone conversations and was a troublesome distraction. It was not, however, possible to resite the printer. The problem was mitigated by encasing the infernal machine in a cabinet with a sound-absorbing lining.

We have found the unreliability of our printer to be a decided drawback. Members of staff often avoid using the computer because of the problems encountered with the printer. For example, we would enter repeat prescriptions to be printed in batches of 20 to 30. The printer would then "chew" the FP10s and the procedure had to be started from square one again. By the time the staff have been through this exercise a few times, they begin to feel it is quicker and safer to carry on writing the prescriptions by hand and just ignore the computer." (3 principals)

The third group of factors concerned issues wider than the individual practice or system:

- N "Cluster meetings are interesting and helpful but personally I would like to see more discussions among the members in order to simplify and advise each other on data loading and also to form a uniform code of diseases where all the members can talk the same language and therefore benefit each other." (2 principals)
- O "Thus, at a local level, I could conclude by saying that computerisation has, and hopefully will continue, to help us run our practice and organise our time. I must say I would be less sanguine about the chance to provide the basis for a proper preventative medicine set-up at a more general level, as this would require a major change in emphasis in how resources are allocated." (4 principals)

FINANCIAL CONSIDERATIONS11.1: Doctors' Expectations and Experiences

Doctors in the detailed evaluation were asked whether they expected that using the computer system would result in decreased running costs or increased income, and after one year whether they had experienced benefits in these areas. They were also asked if they had expected or experienced problems in terms of the capital or running cost of the computer. Responses are summarised in Table 84 (DE, D1 Q62 Q63, D3 Q74 Q72):

Table 84: Financial benefits and problems anticipated by 80 doctors before computerisation and experienced by 66 doctors 1 year afterwards (% reports)

Type of benefit or problem		% Doctors					
		Anticipated before			Experienced after 1 year		
		Yes	?	No	Yes	?	No
Benefits:	Increased income	21	15	65	3	15	82
	Decreased running costs	10	19	71	0	15	85
Problems:	Capital cost	65	25	10	46	21	33
	Running cost	63	14	24	30	40	30

Most doctors did not expect financial benefits and did anticipate some problems. After one year very few reported financial benefits and although the numbers experiencing problems were lower than the numbers of those who had anticipated them, fewer than a third reported no difficulties.

11.2: Non-staffing Costs

The systems cost between £6,000 and £14,000 according to size, half of which was paid by the DTL. Training and the first 3 years' maintenance costs were also met through the scheme. Although the costs of purchase are tending to fall in real terms, those of future maintenance still need to be considered. Additional expenses in this area mainly not covered by the terms of the scheme included insurance, necessary alterations to practice premises, stationery and telephone calls to the suppliers to notify and resolve queries and problems. Figures in these areas were not available (except for alterations to premises which averaged £431 per practice - see Appendix 3.1). However they seem to have caused little difficulty, although many practices found the expenditure on telephone calls to the suppliers irksome.

Data conversion costs were also subsidised by up to 20 pence per record through the scheme. Practices were asked about the cost per record (before subsidy) of data conversion completed. This usually included registration details and repeat medication but not other clinical information. Figures averaging 22.3 pence per record are summarised in Table 85 (LE, INST5):

Table 85: Cost per record of relevant data conversion (% reports from 71 practices)

Cost per record (pence)	% Practices
0-15 pence	25.4
16-25 pence	54.9
26-50 pence	14.1
51-90 pence	5.6

11.3: Staffing Costs

Practices were asked to detail wages paid to employed staff before and one year after computerisation. Payments as part of the 20p subsidy were specifically excluded from these figures. Responses are summarised in Table 86 (LE, PP):

Table 86: Changes in staff wages per month (£) before and 1 year after computerisation (examples and averages from 91 practices)

	Staff wages per month (£)			
	Before	After	Change	% Change
Examples of increases:	220	390	+ 170	+ 77
	1654	2146	+ 492	+ 30
Examples of decreases:	650	489	- 161	- 25
	930	724	- 196	- 21
Averages:	2180*	2457*	+ 277	+ 12.7
* Statistically significant difference: $p < 0.001$				

Although there was large individual variation, most practices increased their payments to staff after computerisation, and the average overall increased by 13%. This increase is greater than the rate of wage inflation and probably represents therefore a real increase. It was offset by the normal 70% staffing reimbursements from the FPC or Health Board which also increased significantly as the figures shown in Table 87 indicate (LE, PP):

Table 87: Changes in reimbursements for staff wages per month (£) before and 1 year after computerisation (examples and averages from 77 practices)

	Reimbursements per month (£)			
	Before	After	Change	% Change
Examples of increases:	1869	2617	+ 748	+ 40
	294	397	+ 103	+ 35
Examples of decreases:	748	506	- 242	- 32
	450	345	- 105	- 23
Averages:	1524*	1745*	+ 221	+14.5
* Statistically significant difference: $p < 0.001$				

Further analysis showed that even after this factor was taken into account, net practice staffing costs increased for two thirds of the practices, with an average overall increase of 29%. It should be noted that these figures relate to the first year of use only, and the trends apparent might be diminished or reversed in succeeding years. Caution in inference is also needed in this section and the two following sections as no comparative figures for practices not using a computer were available.

11.4: Practice Receipts

Although the average capitation payment received by the practices increased by about 5% in the year following computerisation, the change did not reach statistical significance. In any case the magnitude of the increase was similar to the rate of general inflation. However, payments for temporary residents increased over the same period by a third on average. Statistically significant increases were also observed in average receipts for cervical cytology and immunisations of 27% and 12% respectively.

Practices were asked to report payments received for capitation, temporary residents, cervical cytology and immunisations in the first full quarter before and after installation of the computer. These are summarised in Table 88 (LE, FPS1/2):

Table 88: Payments (£) per last full quarter available before and first full quarter available after computerisation (averages, numbers of practices in brackets)

Area of payment	(n)	Practice averages (£)		
		Before	After	% Change
Capitation	(67)	12172	12787	+ 5%
Temporary residents	(64)	258*	343*	+ 33%
Cervical cytology	(67)	154*	195*	+ 27%
All immunisations	(66)	598*	672*	+ 12%
* Statistically significant differences ($p < 0.023$)				

Although seasonal factors could have affected these results, examination of the figures broken down by time of year showed consistent changes in each quarter, and this suggests that seasonal variations were not of major importance in this context.

11.5: FPS Costs

Additional payments to the doctors for staff salaries, temporary residents, and items of service already noted fall in the short term as additional costs to the FPS. Expenses in this sector are also affected by prescribing costs. Figures for these items were less widely available than for other expenses, but those supplied (LE, FPS1/2) showed no average change subsequent to computerisation as the Table 89 indicates:

Table 89: Prescribing costs (£) in last full month available before and first full month available after computerisation (averages: numbers of practices in brackets)

Prescribing costs	(n)	Practice averages (£)	
		Before	After
Total cost of prescribing in a sample month	(45)	16234	16681
Cost per prescription	(42)	3.36	3.39
Cost per person on the NHS prescribing list	(43)	2.04	2.16
No statistically significant differences ($p > 0.21$)			

Two points should be noted. First, these figures were taken before the introduction of the limited list. Second, the 'after' figures represent the first full month available after computerisation; many practices will not have had time to make full use of the computer facilities for repeat prescribing during this period.

11.6: Practice Reports

Some practices commented on financial issues:

- A "Although there is an understanding that we can ask [the supplier] to telephone us back, the reply is not usually very prompt, and our computer operator simply has to sit around and wait. Alternatively, we can make the call but often it has to be during peak hours." (3 principals)
- B "We did not set out to make any money from the computer but it is nice to see that the work engendered is paying for itself." (4 principals)
- C "The tasks for recalling patients for repeat smears and for immunisations could have been carried out manually of course: I am very doubtful if the income these will generate will even match the running costs of the computer let alone the capital cost which apart from the purchasing price has involved converting a room specially to house it, and also a telephone for the room." (3 principals)
- D "Financially it is a non-starter!" (3 principals)

DEVELOPMENT OF GENERAL PRACTICE COMPUTING - CO-ORDINATORS' VIEWS

12.1: Introduction

The Micros for GPs scheme has enabled large numbers of doctors, other primary health care professionals and ancillary staff to become familiar with the operation of a micro-computer in General Practice. This was one of the original aims of the Information Technology Year initiative. The parallel evaluation study has produced a great deal of information about the effects of the introduction of a micro-computer into General Practice.

Perhaps doctors and their staff were brave to be a party to this project. It was certainly surprising that they ventured into what was almost the unknown, and backed their interest with hard cash to the extent of approximately 50% of the cost of the equipment. What is the future for the practices who have been involved? What is the future for computerisation in General Practice?

The 9 local co-ordinators appointed to help run the scheme offer comments based upon their experience concerning the Micros project in their practices, their contacts with individual participant practices, the 'cluster' group meetings, the national meetings of co-ordinators and their meetings with personnel of the companies involved.

12.2: Preparations to Receive a Computer in the Practice

The amount of preparation before installing a computer in the practice varied widely. Contrary to popular belief a computer may provide an incentive to a practice to re-organise, but it will not ease the work of organising a dis-organised general practice. The more organised a practice's records and patient care systems like repeat prescribing and chronic disease surveillance, the easier the installation of a practice computer becomes. However, even then, the use to which the computer is to be put needs to be thought out carefully otherwise it will simply become another practice system (often run in parallel to an existing manual system because staff feel unsure about trusting the computer). It is important to involve key members of the practice office staff in discussions at every stage before the computer is introduced.

12.3: Documentation and Training

The manuals provided were not designed for beginners. Even for computer literates indexing and cross-referencing was inadequate. Manuals might provide information at three levels: firstly a general explanation of the aims and philosophy of the system, secondly a day-to-day operator's manual and lastly, a detailed fall-back or rescue manual. The addition of flow

charts would have been invaluable. Some practices designed their own which were distributed through the co-ordinator network to other practices.

Training provided by companies was generally satisfactory but did not sufficiently cater for the needs of staff development. New staff, joining the practice after the computer was installed, relied upon the existing staff to teach them how to operate it. This was not always satisfactory.

The extra two days training negotiated under the scheme could have been more wisely deployed. Planned intervals between training could help staff progress from a basic level of skill to a higher level. It would also be useful, for training purposes, for the software supplier to have a 'ghost' practice. Indeed, such a facility ought to be a must for public demonstrations.

Computer systems ought to have on-line manuals, training videos and the like. In addition a comprehensive on-line 'Help' programme and a full index of error messages would be invaluable and reduce the dependence of staff on telephoning the software supplier. Ideally the applications software should 'trap' the error messages and either sort the problem out or offer clear advice in English.

12.4: Coping with Crashes

Software and hardware crashes can become a nightmare in a busy general practice dependent upon computer help. Doctors and their staff often found it difficult to persuade the companies that a matter was urgent. 24 hour response times did not respect out-of-office hours problems. A Friday evening crash would not usually get attention until the following Tuesday. In a large, busy practice by that time there would be an enormous backlog of repeat prescriptions. Such an experience undermines the confidence of practice staff in the computer, and is likely to inhibit the extension of its use to other areas of practice activity.

Staff and doctors often felt disheartened that the companies did not truly understand the pressures such crashes created in a working practice, nor the burden of high telephone costs by practices asking for help.

12.5: Relationships with the Companies

Individual practices mostly reported good relationships with their supplying company. The telephone advice on the sorting of bugs in the software was sound and speedy. However, the recent introduction of a telephone answering machine by CAP was a marked retrograde step as the 'ringing back' was fraught with unacceptable delays depending on the company's interpretation of priority.

The contact with the company was acceptable in terms of the initial contact, the installation and the maintenance of the programs supplied. Both companies generously attended cluster meetings throughout the country. They also met and were keen to discuss problems with representatives of the co-ordinators as well as visiting individual practices. The two companies took

diametrically differing views, however, of the value of the cluster co-ordinator network when considering alterations in the programs and modules and installation of the updated versions.

CAP approached the problem by discussion with the group users through individual co-ordinators and the representative of the co-ordinators and then produced amendments in serial programs of updates. These were planned considered alterations but in the view of the users they were unexpectedly tardy-particularly the rewriting of the Call and Recall Treatment module. The growth of the system developed with the establishment of the co-ordinators as the standard 'Beta testing sites' for the programs on initial introduction. The updated module was then on general release to the other users in a polished and hopefully bugfree state. This represented a concerted effort by the company and the co-ordinators to produce an advancement of the programs.

BMDS followed an individual variation program approach suited to the GP20 software and this led to an estimated twenty differing variations of the programs being in use. Thus the group members were unsure of the variations held and used by their fellow members and found discussion of the individual modifications difficult. The drawing together of the best of these variations in a new general release is promised to take place shortly and then the fruits of this approach may be apparent.

The progressive development of programs and modules was a hoped for return for the sums paid out in 'maintenance' monies. But at times the problem of persuading the company that a proposed alteration was reasonable seemed to be in conflict with the company's view of the commercial viability of the changes proposed.

12.6: Enhancements and Additional Modules

Fully operational systems should perhaps not have required many enhancements. In fact, co-ordinators were rather surprised at how much they were needed to advise and push companies for enhancements simply to make the systems provided acceptable at a basic level.

Not surprisingly those practices who progressed most rapidly in their use of the systems applications covered by the scheme soon felt the need to expand the computers to other areas. The lack of an integrated morbidity recording system was the most commonly expressed need. Though there was a limited word processing facility in some systems, the use of the computer for screening and recall made many more practices aware of the need for a more comprehensive and integrated word processing package. Larger practices also often needed additional VDU's and printers and a few opted for a nominal ledger to assist in practice book-keeping.

12.7: Cluster Groups

Each co-ordinator was responsible for organising regular meetings of his cluster members. The meetings were usually open to doctors and staff; this was particularly important as the staff usually knew more, in practical

terms, of what was happening to their system. Not every practice encouraged its staff to attend cluster meetings and this was a pity because those who did attend seemed to benefit greatly from contact with other users.

In some areas, geographical spread led to the development of sub-groups. BMDS users and CAP users also tended to have different needs and in some of the clusters there was an option to meet in separate sub-groups. However, inter-company comparison by cluster members was a means of broadening experience of computer systems and often led to valuable ideas about improving systems.

Initially, apart from helping practices to keep up with their evaluation returns, the co-ordinators found they were much involved in helping to solve installation problems, difficulties over contracts and claims in connection with data conversion.

Once systems began to come on-stream, there was a need to encourage practices to meet to exchange ideas about developing the use of their computers. At this stage cluster members began to ask questions about the inflexibility of the software programs they had and to suggest updates which could improve the usefulness of the systems. Undoubtedly many essential improvements were debated. The inability of the companies to respond quickly to users' demands led to frustration and the realisation that all updates would take months to come through. When updates were finally made available they usually brought with them additional faults which themselves often took weeks to correct.

The latest stage of development of the cluster groups appears to be in two directions. One is the development into true user groups having interests concerning the future development of computerisation in General Practice, with plans to exploit the collection and evaluation of morbidity and other data from the community, and the relationship with supplier companies. The other is to act as a focus for those who are considering purchasing a computer for their practice to meet and discuss their needs with experienced users.

12.8: General Comments on the Central Organisation of the Micros Scheme

It seems unlikely that there will ever be a similar opportunity to link two departments of State and a large professional group in such a study again. Nevertheless there are lessons to be learnt.

The co-ordinators felt that throughout the project there was a strong commitment on the part of the DHSS and the profession to see a successful outcome to the study. For the DHSS and the profession the evaluation of the scheme stood equally with the desire to increase the awareness of those working in primary health care of micro-computer usage. The DTI's commitment was primarily to the latter objective as part of its campaign to encourage the national take-up of computers.

Equally, for health care workers used to the precise and painstaking accounting procedures of FPC's and the DHSS, some of those used in this

project came as a surprise. The companies were paid directly by the DTI in advance for maintenance services the content of which (including definition of the term 'enhancement') the profession was not fully aware. The co-ordinators believe that this was a major factor in producing a lower level of service from the companies than that which was expected.

In fact, the successful completion of data collection for the evaluation and the continued use of so many systems in the practices underlines the foresight of those who planned and organised the project. The network for communication worked well. Departmental changes of staff notwithstanding, these remained a close working relationship between (DHSS) officials, the MRC evaluators and the co-ordinators.

12.9: What did not Happen

One of the reasons for the failure of practices to make maximum use of the computer, apart from where the systems' design was limited or unsuitable, was the length of time it took to load basic data. This meant that for much of the time of the evaluation the appropriate information was not available in the data bank to permit more extensive use of the system.

Practices varied in their attitudes to the use of the right hand side of the prescription. In some practices it was conceived as a way of feeding back information to the doctor who was to sign the prescription. In others it was seen as a method of giving information to the patient directly related to the medication but not necessarily for anything else. There is room for experiment in this area.

Only a few practices batch processed their repeat prescriptions one month ahead. This required a software modification and one company was prepared to do this. In future more practices are likely to adopt this approach which also acts as a hedge in the event of a crash.

Dialogue between suppliers and users was insufficient and too late to enable deficiencies to be corrected within the time limit of the study period. This was partly responsible for a lack of development towards systems which could significantly ease administrative chores and provide a really useful means of quick information retrieval.

12.10: Confidentiality

Under the provisions of the Data Protection Act all GPs who use computers for recording personal health data will be obliged to register as data users. Failure to do so after 11th May 1986 will constitute a criminal offence.

One of the objectives of the Act is to ensure that automated personal data is secure and not divulged without proper safeguards. The DHSS produced a consultative document (DH (84) 25) on establishing a 'Code of Confidentiality' for the NHS. The code may eventually be extended to cover medical records.

During the course of the scheme the co-ordinators became aware that some doctors had been approached to sell electronic records of their prescribing data to market research companies. The co-ordinators foresaw that in such circumstances identifiable patient data might be leaving the doctor's premises on floppy discs without the doctor being fully aware of it. The matter was brought to the attention of the GMSC who issued the following guidance:

"Any information leaving a practice for market research should be checked for confidentiality by the doctor before being handed over. If the information is to be sent on a tape or floppy disc, then the doctor should be able to display that information either on his VDU or by printing out the data into a readable and under-standable form.

Such a check should be carried out on each occasion that information leaves the practice.

The company that supplies the programme should ensure that the general practitioner is instructed on how to carry out this confidentiality check."

Subsequently advice was issued that, in the same way it would be unethical for a doctor to reveal the identity of individual patients prescriptions, it would be unethical for a pharmacist to reveal the prescribing profiles of the doctors whose prescriptions he dispensed. It would also be unethical for a wholesaler to reveal to a market research company the dispensing profiles of the retail pharmacists whom he supplied.

It seemed likely to the co-ordinators that medical information held in practice computers was in most situations at least as secure as ordinary medical records. Proper password protection of data is essential as is the more elementary precaution of ensuring that the processor and the VDU's are kept under lock and key when not in use.

The scheme had no experience of networking but should this become common in medical computing, security of data will require additional protection measures.

12.11: Future Support for the Development of General Practice Computing

The impetus given to General Practice computing by the Micros for GPs scheme marks a milestone in the development of General Practice. It is important that this impetus is maintained. The co-ordinators firmly believe that there is now a need to develop a Regional General Practice Computing Adviser structure so that the many practices throughout the United Kingdom who have computers, or are contemplating introducing them to their practices, may have the benefit of a specialist advisory service. We foresee a role for a Regional General Practice Computing Adviser, in providing educational and organisational support to user practices, to provide a means for transmitting information and data both to FPC's and the DHSS and Health Authorities and the profession centrally, and from these central bodies back to user practices. Such advisers would also help to ensure the continued existence of user groups of practices, which in their turn, should be able to ensure pressure upon supplier companies for change and improvement in the systems they offered. Finally, they would help advise on national tasks concerned with computing in General Practice.

Since we see the role of a Regional General Practice Computing Adviser as largely educational, we believe that he or she should be associated with the Regional Adviser service which already exists in all regions in the United Kingdom. However, the role will demand a general practitioner with a special interest and experience of computing and we would expect that normally he or she would not be involved in other regular adviser work. Clear guidance to Regions on funding such posts will be necessary.

12.12: The Micros Practices

There are now nearly 150 practices with equipment provided under the Micros scheme. They have helped develop software which is giving them some help in the field of registration data, repeat prescribing control, and to a lesser extent, treatment and recall. A few practices are satisfied with the systems as they stand. Others feel they want to have a more flexible electronic aid and can already see that the systems provided are far too rigid to reflect the real needs of primary care. The problem is that technology has moved on a generation and three years has been spent trying to make workable systems out of largely inappropriate and over-rigid software applied to old-fashioned hardware.

Perhaps doctors should look upon their computer system much in the way that they look upon their motor cars. You exchange it for the new model in two or three years' time!

The other problem which practices found was that the equipment originally supplied, for most of the practices, was of the single user type. In fact, practices are naturally multi-tasking and any successful computer system must have that facility. Some of the larger practices ran out of keyboard time and found that they were nearly whole-time involved in patient registration and the amendment of patient registration data, with little time for keyboard tasks such as repeat prescribing and treatment and recall. Adding on an extra terminal often slowed the computer operation. Some practices would wish to have word processing and nominal ledger facilities but not at the expense of reducing the efficiency of the operation of the main patient/clinical programmes.

12.13: What of the Future

General Practice requires flexible systems which can be adapted to individual practices' needs. Practices have many similarities but all practices are different in detail. Further, whatever system is in operation, it must be reliable. GPs cannot tolerate a computer-controlled repeat prescription system which goes on the blink for two or three days and causes chaos.

There is no doubt that the the introduction of the scheme helped to change official attitudes to General Practice computing. This process is likely to continue in the future and already there have been developments with DHSS and SHHD encouragement which have implications for the future.

The scheme has produced a larger number of practices with computer experience than would have been possible without it. The experience of these practices can act as the foundation for what we hope we will be the future growth of computing in General Practice.

12.14: Financing General Practice Computerisation

The evaluation study has shown that there is a limited potential for generating income from the use of a computer in general practices. Since General Practice is very much a service industry and, moreover, with a virtual monopoly paymaster, the cost of any computer operation will be of key importance.

Some of the expenses of running a practice are re-imbursed directly by the DHSS whilst the majority are returned to the doctor indirectly via the expenses element in the practice and thus doctors without computers benefit at the expense of those who have them. Clearly, if general practitioners are to be encouraged to use computers in their practices then there is an urgent need for the professional negotiators to agree that the costs should be directly returned to the doctors involved. If the use of computers in General Practice results in better patient care then the NHS should welcome the promotion of their use by a direct contribution to both the capital and revenue costs.

Furthermore, the DHSS has recognised the importance of having reliable, timely and relevant information, for the purposes of health service planning and management. As a result Regional Health Authorities have been implementing costly computerisation strategies.

As general practitioners are responsible for the care of 90% of morbidity in the NHS, it is they who will be the richest source of Health Services Information. The co-ordinators hope that the DHSS recognises that if they are to persuade general practitioners to supply this information, then they must consider funding the provision of computers in GPs' premises.

12.15: Conclusion

As the result of our collective experience over the last three years, we believe that the future of computers in General Practice depends on the one hand, on the development of totally flexible systems which can be sensitive to the needs of the individual practice, and on the other hand, on the introduction of an equitable method of re-imbursing a fair proportion of the capital and revenue costs of practice computerisation. Fortunately, there are now computer systems which are flexible, which have large capacity and are priced moderately. The remaining hurdle appears to be the need for a solution to the question of finance.